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Emissions from Two In-Use Heavy-Duty Diesel Engines

Southwest Research Inst., San Antonio, TX

Prepared for

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Emissions From Two In-Use Heavy-Duty Diesel Engines

by

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6220 Culebra Road
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Contract No. 68-03-3162
Work Assignment 16

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Prepared for

ENVIRONMENTAL PROTECTION AGENCY
Emission Control Technology Division
2565 Plymouth Road
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Publication No. 460/3-84-017

FOREWORD

This report covers Work Assignment No. 16 of EPA Contract 68-03-3162, performed for the Emission Control Technology Division, Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105. The EPA Contracting Officer is Mr. James M. Bzdusek, and the Project Officers were Mr. Robert J. Garbe and Mr. Craig A. Harvey. Mr. Ralph C. Stahman was the EPA Branch Technical Representative. The Southwest Research Institute Project Leader was Sherrill F. Martin. The project was performed during February through April, 1984, and was identified as SwRI Project 03-7338-016.

ABSTRACT

Emission measurements were made on heavy-duty diesel engines removed from two in-service vehicles. Smoke, 13-mode, and transient Federal Test Procedures were performed. Transient results are compared to results from a chassis version of the 1983 transient test for the two vehicles, conducted under Contract 68-02-3722. The possibility of correlation between the two test methods is discussed.

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I. SUMMARY

Two heavy-duty diesel engines, a 1981 Cummins NTC-300 and a 1980 Detroit Diesel 8V-92TA, were tested in an engine test cell. Emission tests conducted were Smoke, 13-mode, and Transient Federal Test procedures. Both engines had been removed from in-service vehicles for testing in this program. Engine emissions are summarized in Tables 1 and 2.

TABLE 1. TEST CELL EMISSIONS SUMMARY, CUMMINS NTC-300

Smoke Test Results	% Opacity		
	"A" Factor	"B" Factor	"C" Factor
	9.0	3.1	14.9

Emission Test Results	Emissions in g/hp hr					
			NO_x			BSFC,
	HC	CO	Bag	Cont.	Part.	lb/hp-hr
13-Mode (average)	0.90	1.44	----	8.17	----	0.390
Transient (average)	1.36	2.70	7.10	8.13	0.45	0.413

TABLE 2. TEST CELL EMISSIONS SUMMARY, DETROIT DIESEL 8V-92TA

Smoke Test Results	% Opacity		
	"A" Factor	"B" Factor	"C" Factor
	13.1	2.1	20.1

Emission Test Results	Emissions in g/hp hr					
			NO_x			BSFC,
	HC	CO	Bag	Cont.	Part.	lb/hp-hr
13-Mode (average)	0.56	2.10	----	7.94	----	0.424
Transient (average)	0.53	2.61	7.32	8.15	0.45	0.435

Comparison with data taken from the series of tests with the engines in vehicles shows apparent poor agreement in one instance and excellent agreement in the other. Data were taken from the highest available GVW because the agreement with the test cell data was closest. On a gram/kilogram of fuel basis, the comparisons are given in Table 3.

TABLE 3. EMISSIONS COMPARISON, CHASSIS VS. ENGINE TESTS, g/kg FUEL

	HC	CO	CO_2	NO_x	PART.
NTC-300					
Engine	7.26	14.42	3139.	37.9	2.40
Chassis[a]	8.55	11.40	3134.	29.6	3.44
8V-92 TA					
Engine	2.69	13.24	3145.	37.1	2.28
Chassis[b]	2.82	13.02	3150.	36.7	2.41

[a] at 93% of GVW
[b] at 97% of GVW

The good agreement for the 8V-92TA occurred at 97% of GVW. This good agreement, particularly with respect to CO, would not have been achieved at lower percentages of GVW. Good agreement occurs on a distance (grams per kilometer) basis only if the number of kilometers for the engine cycle is adjusted, based on CO_2 values. It seems clear that correlation between the engine and chassis tests, if achievable, will have to take into account the GVW of the engine applications.

Plots of the data using GVW/HP as the independent variable show that HC, NO_x, and particulate may correlate on a one-to-one basis at about a 180 lb/hp ratio. If confirmed by additional data, there are indications that correlation relationships may be possible for other GVW/HP ratios.

II. INTRODUCTION

On January 31, 1984, Work Assignment No. 16, entitled "Heavy-Duty Diesel Engine Transient Tests," was authorized by the EPA Contracting Officer for Contract 68-03-3162. The objective of this work assignment was to measure exhaust emissions from two heavy-duty diesel engines by performing Federal Smoke, 13-mode, and Transient tests. The data were to be compared to exhaust emissions data collected from the same engines when they were installed in vehicles and tested on a chassis dynamometer. This objective was accomplished successfully.

III. TEST PLAN, ENGINES, AND FUELS

This section describes the test plan, engines, and fuel used in this work assignment.

A. Test Plan

The test plan for this project follows the Scope of Work for Work Assignment No. 16, presented as Figure 1.

B. Engines

The engines selected for this program were a 1981 Cummins NTC-300 and a 1980 Detroit Diesel 8V-92TA. These engines were both removed from in-service vehicles for testing under this work assignment. Descriptions of each engine, as taken from data supplied by the manufacturers, are shown in Table 4. Also shown are the inlet and exhaust restrictions used in the various tests. Figures 2 and 3 are photographs of the engines.

TABLE 4. DESCRIPTION OF TEST ENGINES

Manufacturer	Cummins	Detroit Diesel
Model	1981 NTC-300	1980 8V-92TA
Serial No.	11004033	8VF066052
No. of Cylinders	6	8
Arrangement	Inline	V
Aspiration Type	Turbocharged, Intercooled	Turbocharged, Intercooled
Rated Output	300 H.P.	365 H.P.
Rated Speed	2100 rpm	1950 rpm
Rated Torque Speed	1300 rpm	1400 rpm
Restrictions at rated speed inl./exh.	In. H_2O/In. Hg.	In. H_2O/In. Hg.
13-Mode	20/2	20/3
Transient	20/2	12/3

C. Fuel

The test fuel used in this program was a D-2 emissions compliance fuel obtained from Phillips Chemical Co. and coded by SwRI as EM-597-F. This fuel has become widely used by many manufacturers as well as EPA. Pertinent fuel properties determined by Phillips Chemical Co. are given in Table 5, along with EPA specifications for emissions test fuel. Engine oil was that which was in the crankcase when the engines were removed from the vehicles.

SCOPE OF WORK
HEAVY-DUTY ENGINE PROJECT

The purpose of this task is to measure exhaust emissions from two heavy duty diesel engines using three EPA engine test procedures. the data are to be compared to exhaust emissions data previously collected from the same engines when they were installed in vehicles and tested on a chassis dynamometer. If a satisfactory correlation can be found between the engine and chassis dynamometer results, consideration will be given to utilizing chassis dynamometer data from in-use vehicles for development of HDD emission factors.

The contractor is required to do the following work on each of two engines which will be supplied by the engine manufacturers complete with all accessories required for engine testing:

1. Install engine on engine dynamometer and instrument as required.
2. Run one test using the Federal Smoke Test Procedure.
3. Run two Federal 13-mode test sequences.
4. Run three cold-hot four-bag procedures while measuring continuous heated HC and NO_x and run bag analyses for CO, CO_2, and NO_x.
5. Remove engine for return to manufacturer.
6. Prepare report of each engine test summarizing all the data collected.

Figure 1. Scope of work heavy-duty engine project

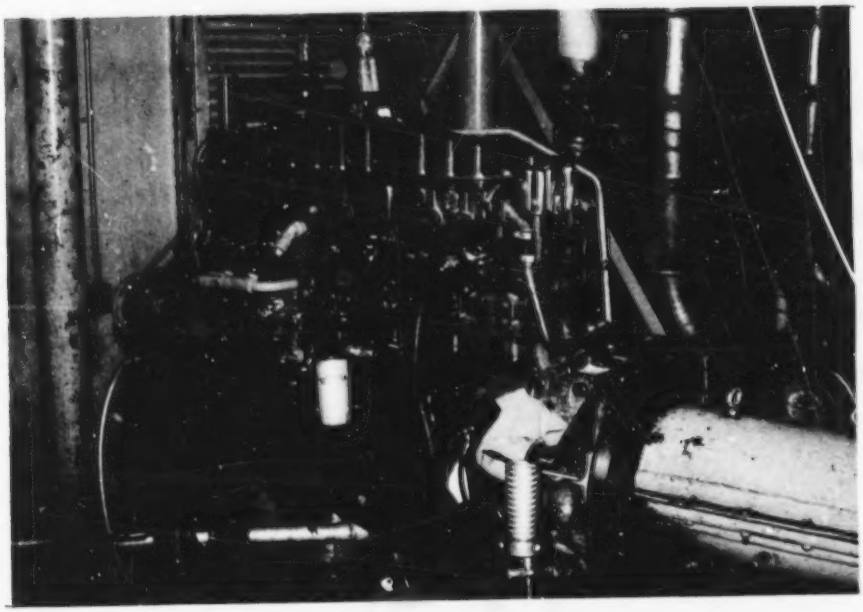

Figure 2. 1981 Cummins NTC-300 mounted for testing

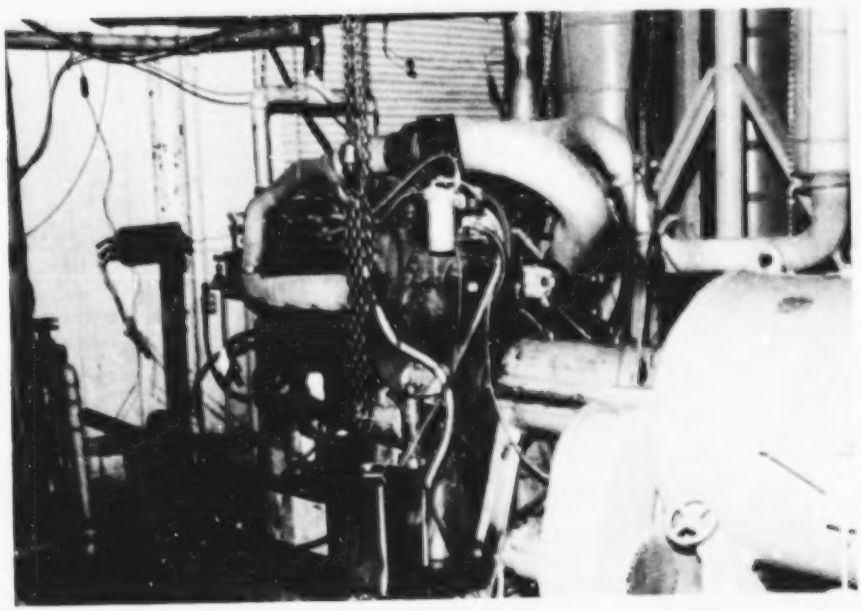

Figure 3. 1980 Detroit Diesel 8V-92TA removed from vehicle

TABLE 5. PROPERTIES OF PHILLIPS D-2 DIESEL CONTROL FUEL (SwRI EM-597-F)

Laboratory Test Report

PHILLIPS CHEMICAL COMPANY
A SUBSIDIARY OF PHILLIPS PETROLEUM COMPANY

BARTLESVILLE, OKLAHOMA 74004

DATE OF SHIPMENT 4-12-84
CUSTOMER ORDER NO. 33044
INV. OR REQN. NO. 00996S

EM-597-F
Diesel D-2 DCF
Lot No. G-075

Test	Results	EPA Specifications
Density, g/ml	0.8488	
API Gravity, 60 F	35.2	33 - 37
Sulfur, Wt%	0.35	0.2 - 0.5
Particulate Matter, mg/liter	2.07	
Pour Point, F	0	
Kinematic Viscosity, 40° C, CS	2.52	2.0 - 3.2
Flash Point, PM, F	162	130 Min.
Cloud Point, F	+12	
Distillation, D-86, °F		
IBP	375	340 - 400
5%	415	
10	431	400 - 460
20	451	
30	469	
40	487	
50	505	470 - 540
60	523	
70	543	
80	567	
90	598	550 - 610
95	628	
DP	648	
EP	653	580 - 660
Composition, Vol% by FIA		
Aromatics	32.10	27 Min.
Olefins	1.33	
Paraffins & Naphthenes	66.57	
Cetane Number	46.2	42 - 50
Elemental Analysis, wt, %		
Carbon	86.12	
Hydrogen	12.92	
Nitrogen	0.08	
Oxygen	0.06	
C/H	6.66	

IV. DISCUSSION OF RESULTS

This section presents the results of the engine-stand test of the two engines tested under this work assignment. Both engines were subjected to the same test series:

- One Federal Smoke Test
- Two 13-mode Emissions Tests
- Three 4-bag cold-hot Transient Tests

Section A presents the results of tests on the Cummins NTC-300 engine. Section B gives corresponding results for the Detroit Diesel 8V-92TA engine. Section C compares the test stand results with the chassis dynamometer results.

A. Cummins NTC-300 Results

The 1981 Cummins NTC-300, serial 11004033, was tested as called for in the Test Plan. Testing proceeded with no significant problems. Smoke test results are given in Table 6, 13-mode tests in Table 7, and transient results in Table 8.

TABLE 6. SMOKE TEST RESULTS 1981 CUMMINS NTC-300

"Factor"	A	B	C
Opacity, Percent	9.0	3.1	14.9

TABLE 7. THIRTEEN-MODE TEST RESULTS, 1981 CUMMINS NTC-300

Test	Emission Rate, g/hp-hr HC	CO	NO_x	BSFC, lb/hp-hr
D59-1	0.94	1.45	8.07	0.389
D59-2	0.85	1.44	8.26	0.391

TABLE 8. TRANSIENT TEST RESULTS, 1981 CUMMINS NTC-300

Test	Emission Rate, g/hp-hr HC	CO	NO_x Bag	NO_x Cont.	Part.	BSFC, lb/hp-hr
D59-3	1.41	2.81	7.14	8.36	0.47	0.413
D59-4	1.30	2.67	7.14	7.95	0.42	0.412
D59-5	1.37	2.61	7.02	8.09	0.46	0.415

Computer printouts of the detailed test results are included in the data section in Appendix A. All emissions seem reasonable. The results of the 13-mode and smoke tests are within the applicable Federal regulations for the 1981 model year. Transient test standards did not exist for that model year.

B. Detroit Diesel 8V-92TA Results

The 1980 Detroit Diesel 8V-92TA, serial 8VF066052, was tested as called for in the Test Plan.

No problems occurred during testing. Smoke test results are given in Table 9, 13-mode tests in Table 10, and transient results in Table 11.

TABLE 9. SMOKE TEST RESULTS, 1980 DDA 8V-92TA

"Factor"	A	B	C
Opacity, Percent	13.1	2.1	20.1

TABLE 10. THIRTEEN-MODE TEST RESULTS, 1980 DDA 8V-92TA

Test	Emission Rate, g/hp-hr HC	CO	NO_x	BSFC, lb/hp-hr
D60-1	0.55	2.21	7.96	0425
D60-2	0.56	1.98	7.93	0.424

TABLE 11. TRANSIENT TEST RESULTS, 1980 DDA 8V-92TA

Test	Emission Rate, g/hp-hr HC	CO	NO_x Bag	NO_x Cont.	Part.	BSFC, lb/hp-hr
D60-1	0.51	2.56	7.53	8.10	0.45	0.435
D60-2	0.53	2.58	7.41	8.25	0.39	0.440
D60-3	0.55	2.70	7.03	8.11	0.50	0.429

Detailed computer printouts of the test results are included in the data section in Appendix B. As with the Cummins engine, all emissions were reasonable, and within applicable Federal standards.

C. Comparison of Chassis vs. Engine Stand Results

The chassis test results are available in two forms, grams/kilometer and grams/kilogram of fuel. These results are excerpted from Table 7 of reference (1)*, (Table 12). The driving cycle for the chassis tests is not an official EPA cycle, but is taken from reference (2). For a brief description of the chassis test program, see Appendix C.

Engine stand data normally are in terms of grams/kw-hr. Since work output (kw-hr) information is not readily available from the chassis test, the test stand data have been converted to g/km and g/kg fuel for comparison purposes. The composite distance (kilometer) value for the transient cycle is 10.30(3). Table 13 shows the Cummins NTC-300 comparison in terms of

TABLE 13. ENGINE VS. CHASSIS TESTS, CUMMINS NTC-300

	Emissions in Grams/Kilogram of Fuel				
TEST	HC	CO	CO_2	NO_x	Part.
Engine	7.26	14.42	3139.	37.9	2.40
Chassis[a]	8.55	11.4	3134.	29.6	3.44
% Diff.	18.	-21.	0.	-22.	43.

[a]93% of GVW, reduced power

grams/kilogram of fuel. The chassis values used for comparisons are those for the 93% of GVW, reduced power** condition, which gives the best agreement. However, with this engine, agreement is not good. While HC is 18% high for the chassis tests, CO and NO_x are 21% and 22% low, respectively; and particulate is 43% high. The excellent agreement of the CO_2 measurements is a good check of the integrity of the bag sampling systems, since the carbon in the CO_2 accounts for about 86% of the total mass of fuel burned. The grams/kilometer data, Table 14, show about the same scatter as the grams/kilogram fuel data.

TABLE 14. ENGINE VS. CHASSIS TESTS, CUMMINS NTC-300

	Emissions in Grams/Kilometer				
TEST	HC	CO	CO_2	NO_x	Part.
Engine	2.80	5.55	1210.	14.6	0.93
Chassis[a]	3.14	4.20	1152.	10.8	.26
% Diff.	12.	-14.	-5.	-26.	35.

[a]93% of GVW, reduced power

*Numbers in parentheses refer to references at the end of this report.

**Due to an error in the calculation of frontal area, tests for this vehicle were run at lower than standard horsepower settings. Later tests show the effect of this error to be small.

TABLE 12. SUMMARY OF EMISSIONS OF TRUCKS TESTED OVER THE CHASSIS VERSION OF THE TRANSIENT CYCLE

Task	Vehicle	Engine Description			Emissions, g/km					Emissions, g/kg fuel				
		Year	Manufacturer	Model	HC	CO	CO_2	NO_x[a]	Part.	HC	CO	CO_2	NO_x[a]	Part.
3	23	1981	Cummins	NTC-300										
			61% of GVW, reduced HP		3.33	3.79	1006	8.37	1.22	10.4	11.8	3128	26.1	3.80
			70% of GVW, reduced HP		3.16	3.70	1036	8.99	1.19	9.60	11.2	3130	27.2	3.59
			80% of GVW, reduced HP		3.54	4.15	1110	10.4[b]	1.31	10.0	11.7	3128	30.0[b]	3.68
			93% of GVW, reduced HP		3.14	4.20	1152	10.8	1.26	8.55	11.4	3134	29.6	3.44
3	24	1980	Detroit Diesel	8V-92-TA										
			55% of GVW		1.71	3.36	1416	14.4	1.14	3.83	7.50	3156	32.1	2.53
			70% of GVW		1.62	4.67	1609	17.6	1.35	3.18	9.17	3155	34.4	2.64
			70% of GVW, reduced HP		1.68	4.13	1534	16.4	1.16	3.46	8.48	3155	33.7	2.37
			86% of GVW		1.65	5.81	1775	19.8	1.26	2.93	10.4	3154	35.2	2.24
			97% of GVW		1.66	7.62	1847	21.5	1.41	2.82	1302	3150	36.7	2.41

[a] NO_x from bag measurement
[b] NO_x is from test 32327 Run 2 only

The 8V-92 TA results present an entirely different picture. In the case of the grams/kilogram fuel comparison for 97% of GVW, Table 15, agreement is

TABLE 15. ENGINE VS. CHASSIS TESTS, DDA 8V-92TA

	Emissions in Grams/Kilogram of Fuel				
TEST	HC	CO	CO_2	NO_x	Part.
Engine	2.69	13.24	3145.	37.1	2.28
Chassis[a]	2.82	13.02	3150.	36.7	2.41
% Diff.	5.	-2.	0.	-1.	6.

[a]97% of GVW

excellent on all emissions. The variations are about the same as expected on a run-to-run basis for the engine stand alone. The grams/kilometer comparison, Table 16, does not at first look like good agreement if the 10.3 km cycle length is used. However, it would seem that the distance assigned to the engine transient cycle could be a variable. It would be dependent, among other things,

TABLE 16. ENGINE VS. CHASSIS TESTS, DDA 8V-92TA

	Grams/Kilometer				
TEST	HC	CO	CO_2	NO_x	Part.
Engine[a]	1.35	6.63	1576.	18.6	1.14
Engine[b]	1.58	7.77	1847.	21.8	1.34
Chassis	1.66	7.62	1847.	21.5	1.41
% Diff[a]	23.	15.	17.	16.	24.
% Diff[b]	5.	-2.	0.	-1.	5.

[a]10.30 km/cycle
[b]8.79 km/cycle, normalized for equivalent CO_2

on the GVW and road load power of the vehicle with which the comparison is being made. If, in the case of the 8V-92TA, the distance traveled figure is adjusted to give equal CO_2/kilometer numbers, the comparison is the same as in the lines referred to by footnote b in Table 16. This comparison is, of course, the same as the gm/kilogram fuel comparison.

To investigate why the 8V-92TA showed apparent agreement, while the NTC-300 did not, requires examination of the data at varying GVW. It can be seen, comparing the fuel specific data in Table 13 with those in Table 15, that correlation improves as engine loading increases. It is also true that the NTC-300 operated under more lightly loaded conditions than did the 8V-92TA. The GVW used for single-axle tractors was 41,500 lb.[4]. The GVW for tandem-axle tractors was 78,000 lb.[4]. Using the maximum powers developed by the engines under this work assignment, 319 H.P. and 420 H.P., respectively, gives a weight to power ratio of 130 lb/hp for the NTC-300 application, while the value for the 8V-92TA vehicle is 186 lb/hp.

Figures 4 through 7 contain plots of the NTC-300 and 8V-92TA emissions data versus the lb/hp loading at which the tests were run. The emissions have been normalized as a percentage of that obtained from the engine tests. The 8V-92TA data show that correlation for all four emissions occurred about 180 lb/hp. Including the NTC-300 data in a regression analysis supports this observation for all emissions except CO. Additional tests with a variety of vehicles would be necessary to support this indication of possible correlation.

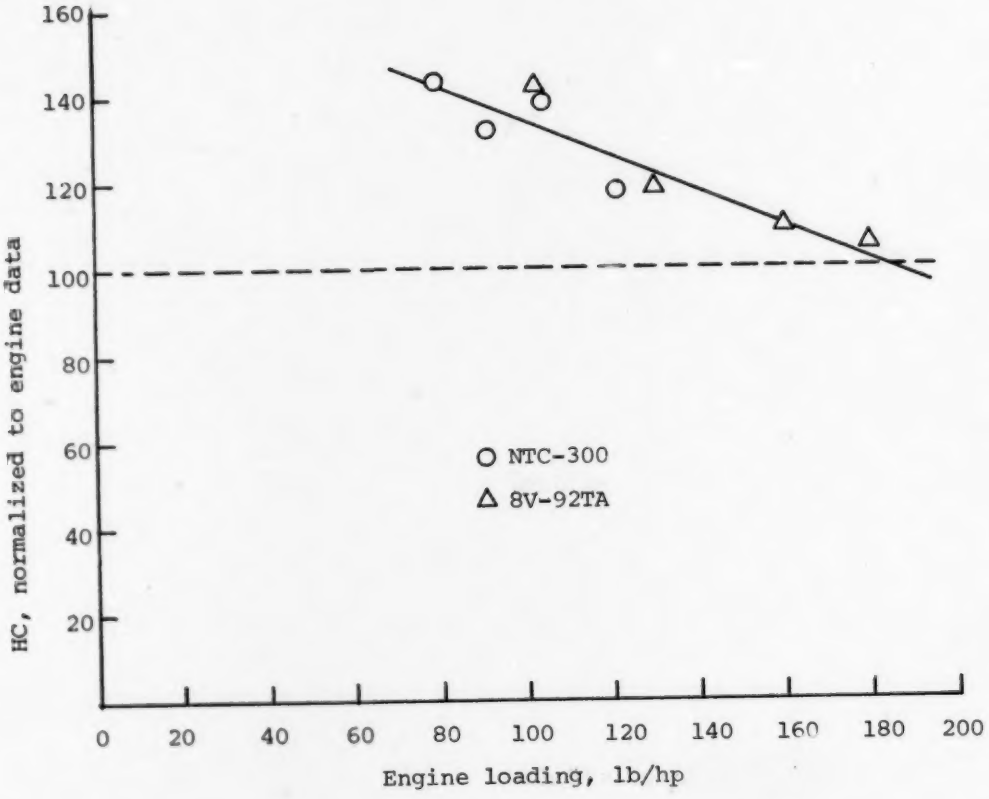

Figure 4. Normalized HC vs chassis engine loading

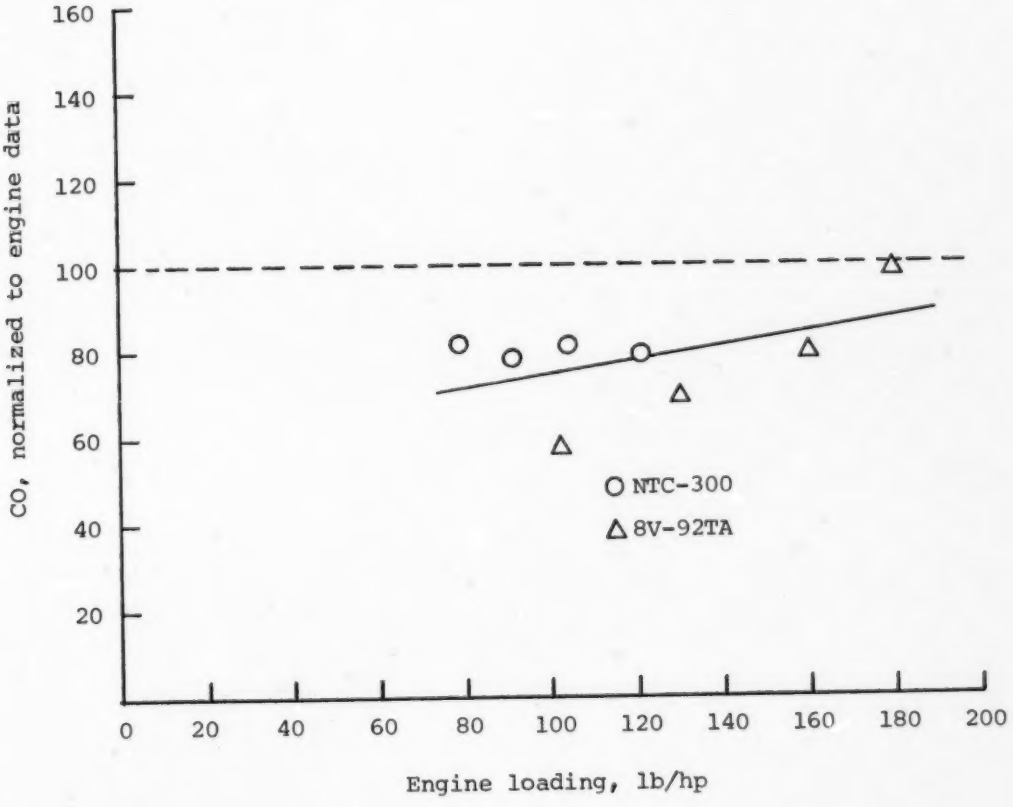

Figure 5. Normalized CO vs chassis engine loading

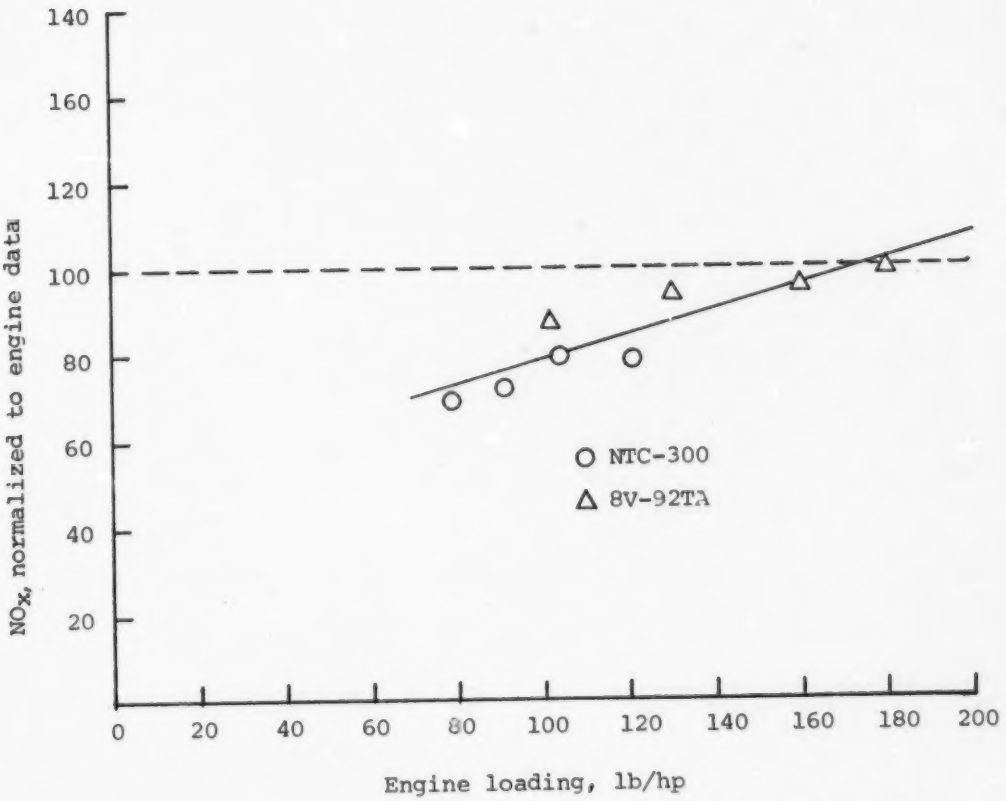

Figure 6. Normalized NO_x vs chassis engine loading

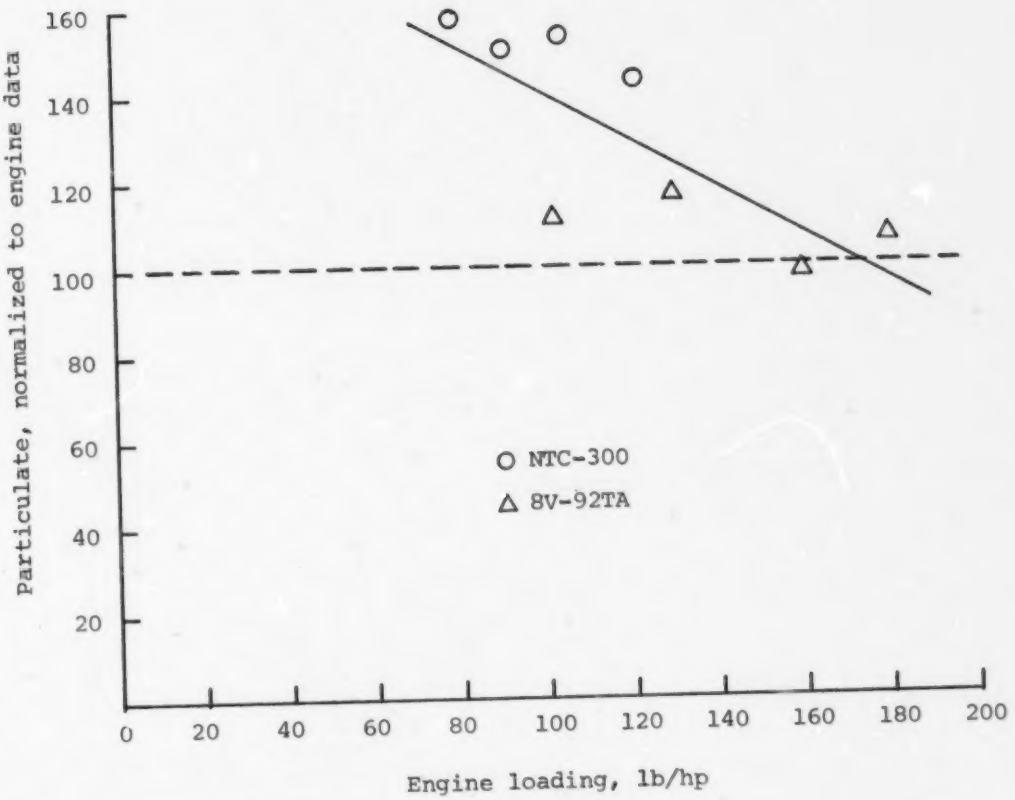

Figure 7. Normalized particulate vs chassis engine loading

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3. Tim Cox, EPA - Ann Arbor, October, 1979.

4. Draft Final Report, "Characterization of Heavy-Duty EPA Emissions Under Transient Driving Conditions," M.A. Warner-Selph and H.E. Dietzmann, July, 1984, EPA Contract No. 68-02-3722.

APPENDIX A

1981 Cummins NTC-300

Test Results

Table	
A-1	Smoke Test Trace Evaluation
A-2 and A-3	Thirteen-Mode Computer Printouts
A-4 through A-9	Transient Computer Printouts
A-10	Engine Map Data

TABLE A-1. **FEDERAL SMOKE TEST TRACE EVALUATION**

Engine Model: Cummins NTC-300 Test No. 1 Date: 3/8/84

Engine S/N: 11004033 Run No. 1 Eval. By: Kathy Jack

Accelerations

First Sequence		Second Sequence		Third Sequence	
Interval No.	Smoke %	Interval No.	Smoke %	Interval No.	Smoke %
1	7.6	1	16.8	1	18.0
2	16.7	2	16.0	2	16.0
3	12.0	3	11.3	3	11.5
4	12.0	4	13.2	4	13.2
5	11.0	5	13.0	5	12.5
6	12.0	6	10.3	6	7.0
7	11.5	7	5.6	7	5.2
8	6.6	8	4.0	8	4.2
9	5.0	9	10.5	9	3.6
10	8.0	10	10.0	10	7.0
11	11.0	11	7.5	11	10.5
12	9.8	12	4.5	12	10.0
13	7.5	13	4.0	13	6.5
14	5.2	14	2.6	14	3.4
15	4.0	15	2.5	15	3.0
Total Smoke %	141.8		131.8		132.1

Factor (a) = $\frac{405.7}{45}$ = 9.0 %

Lugging

First Sequence		Second Sequence		Third Sequence	
Interval No.	Smoke %	Interval No.	Smoke %	Interval No.	Smoke %
1	3.2	1	3.2	1	3.3
2	3.2	2	3.1	2	3.1
3	3.2	3	3.0	3	3.0
4	3.1	4	3.0	4	3.0
5	2.9	5	2.9	5	3.0
Total Smoke %	15.6		15.2		15.4

Factor (b) = $\frac{46.2}{15}$ = 3.1 %

Comments:

1	16.7	1	16.8	1	18.0
2	12.0	2	16.0	2	16.0
3	12.0	3	13.2	3	13.2
	40.7		46.0		47.2

Factor (c) = $\frac{133.9}{9}$ = 14.9 %

Smoke trace evaluation

TABLE A-2.

13-MODE FEDERAL DIESEL EMISSION CYCLE 1979

ENGINE: CUMMINS NTC-300 BAROMETER: 29.44
TEST 1 FUEL: EM-528-F PROJECT: 03-7338-016 DATE: 3/6/84

MODE	POWER PCT	ENGINE SPEED COND / RPM	TORQUE OBS LB-FT	POWER OBS BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	INTAKE HUMID GR/LB	NOX CORR FACT	MEASURED HC PPM	MEASURED CO PPM	MEASURED CO2 PCT	MEASURED NOX PPM	CALCULATED GRAMS / HOUR HC	CALCULATED GRAMS / HOUR CO	CALCULATED GRAMS / HOUR NOX	MODE
1		IDLE / 650.	0.	.0	.065	9.68	25.	.868	520.	212.	1.23	100.	71.	58.	39.	1
2	2	INTER / 1300.	19.	4.7	.153	20.43	25.	.883	444.	159.	1.54	135.	117.	84.	103.	2
3	25	INTER / 1300.	240.	59.4	.400	21.92	25.	.893	216.	106.	4.19	485.	58.	55.	369.	3
4	50	INTER / 1300.	481.	119.1	.700	24.61	25.	.902	174.	146.	6.65	945.	53.	84.	803.	4
5	75	INTER / 1300.	721.	178.5	1.083	27.65	25.	.911	152.	306.	8.48	1440.	57.	214.	1499.	5
6	100	INTER / 1300.	984.	243.6	1.375	31.87	25.	.916	128.	908.	9.96	1830.	52.	684.	2059.	6
7		IDLE / 650.	0.	.0	.057	9.42	25.	.864	520.	239.	1.23	100.	62.	57.	34.	7
8	100	RATED / 2100.	788.	315.1	1.717	61.39	24.	.897	200.	106.	6.57	1260.	150.	152.	2642.	8
9	75	RATED / 2100.	593.	237.1	1.438	54.49	24.	.895	200.	106.	5.76	955.	142.	145.	1909.	9
10	50	RATED / 2100.	395.	157.9	1.103	47.06	24.	.892	200.	93.	4.87	620.	128.	115.	1120.	10
11	25	RATED / 2100.	198.	79.2	.657	39.90	24.	.884	320.	173.	3.68	355.	159.	168.	497.	11
12	2	RATED / 2100.	16.	6.4	.350	34.40	24.	.875	552.	212.	2.06	170.	251.	191.	219.	12
13		IDLE / 650.	0.	.0	.058	9.68	24.	.870	440.	212.	1.36	115.	50.	48.	37.	13

MODE	CALCULATED GRAMS/LB-FUEL HC	CO	NOX	CALCULATED GRAMS/BHP-HR HC	CO	NOX	F/A DRY MEAS	F/A STOICH	"PHI"	WET HC CORR FACT	F/A CALC	F/A PCT MEAS	POWER CORR FACT	BSFC CORR LB/HP-HR	MODAL WEIGHT FACTOR	MODE
1	18.31	14.94	9.98	**********		******	.0067	.0690	.098	.988	.0062	-8.1	.983	*****	.067	1
2	12.77	9.12	11.16	24.98	17.85	21.83	.0075	.0690	.109	.985	.0076	.8	.983	1.990	.080	2
3	2.41	2.31	15.37	.97	.93	6.21	.0183	.0690	.265	.962	.0198	8.0	.984	.410	.080	3
4	1.25	2.01	19.12	.44	.71	6.74	.0285	.0690	.414	.942	.0310	8.5	.986	.358	.080	4
5	.87	3.30	23.06	.32	1.20	8.40	.0393	.0690	.570	.928	.0392	-.3	.991	.368	.080	5
6	.63	8.29	24.95	.21	2.81	8.45	.0433	.0690	.627	.916	.0460	6.2	.994	.341	.080	6
7	18.28	16.80	9.91	**********		******	.0060	.0690	.087	.988	.0062	2.8	.984	*****	.067	7
8	1.46	1.47	25.65	.48	.48	8.39	.0281	.0690	.407	.943	.0306	9.1	1.026	.318	.080	8
9	1.65	1.68	22.12	.60	.61	8.05	.0265	.0690	.384	.950	.0269	1.8	1.017	.358	.080	9
10	1.93	1.74	16.91	.81	.73	7.09	.0235	.0690	.341	.957	.0229	-2.7	1.008	.416	.080	10
11	4.03	4.26	12.62	2.00	2.12	6.28	.0165	.0690	.239	.967	.0175	6.1	1.000	.498	.080	11
12	11.95	9.11	10.43	39.21	29.91	34.23	.0102	.0690	.148	.981	.0101	-.9	.996	3.295	.080	12
13	14.19	13.66	10.52	**********		******	.0060	.0690	.088	.987	.0068	11.9	.980	*****	.067	13

CYCLE COMPOSITE USING 13-MODE WEIGHT FACTORS

BSHC ------- =	.942	GRAM/BHP-HR
BSCO ------- =	1.449	GRAM/BHP-HR
BSNOX ------ =	8.074	GRAM/BHP-HR
BSHC + BSNOX =	9.016	GRAM/BHP-HR
CORR. BSFC - =	.389	LBS/BHP-HR

TABLE A-3.

13-MODE FEDERAL DIESEL EMISSION CYCLE 1979

ENGINE: CUMMINS NTC-300 BAROMETER: 29.54
TEST-2 FUEL: EM-528-F PROJECT: 03-7338-016 DATE: 3/7/84

MODE	POWER PCT	ENGINE SPEED COND / RPM	TORQUE OBS LB-FT	POWER OBS BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	INTAKE HUMID GR/LB	NOX CORR FACT	MEASURED HC PPM	MEASURED CO PPM	MEASURED CO2 PCT	MEASURED NOX PPM	CALCULATED GRAMS / HOUR HC	CALCULATED GRAMS / HOUR CO	CALCULATED GRAMS / HOUR NOX	MODE
1		IDLE / 650.	0.	.0	.063	9.65	37.	.895	464.	212.	1.27	105.	61.	55.	40.	1
2	2	INTER / 1300.	19.	4.7	.168	20.72	37.	.908	360.	133.	1.63	145.	100.	73.	119.	2
3	25	INTER / 1300.	246.	60.9	.410	21.95	37.	.915	152.	159.	4.32	495.	41.	83.	384.	3
4	50	INTER / 1300.	492.	121.8	.700	24.71	37.	.923	140.	186.	6.65	945.	42.	107.	821.	4
5	75	INTER / 1300.	738.	182.7	1.102	28.30	37.	.930	114.	345.	8.58	1470.	43.	243.	1570.	5
6	100	INTER / 1300.	996.	246.5	1.413	32.23	37.	.934	100.	908.	10.08	1875.	41.	695.	2187.	6
7		IDLE / 650.	0.	.0	.063	9.68	37.	.892	480.	239.	1.19	105.	66.	66.	42.	7
8	100	RATED / 2100.	786.	314.3	1.745	61.40	37.	.923	200.	119.	6.65	1260.	151.	171.	2730.	8
9	75	RATED / 2100.	590.	235.9	1.437	54.13	37.	.921	180.	80.	5.84	935.	126.	108.	1897.	9
10	50	RATED / 2100.	393.	157.1	1.110	47.04	37.	.919	200.	80.	5.01	620.	126.	97.	1129.	10
11	25	RATED / 2100.	197.	78.8	.657	39.89	37.	.914	304.	146.	3.74	350.	149.	140.	499.	11
12	2	RATED / 2100.	16.	6.4	.317	34.03	37.	.908	544.	199.	2.01	165.	229.	167.	205.	12
13		IDLE / 650.	0.	.0	.063	9.64	37.	.892	400.	186.	1.36	120.	49.	46.	43.	13

MODE	CALCULATED GRAMS/LB-FUEL HC	CO	NOX	CALCULATED GRAMS/BHP-HR HC	CO	NOX	F/A DRY MEAS	F/A STOICH	"PHI"	WET HC CORR FACT	F/A CALC	F/A PCT MEAS	POWER CORR FACT	BSFC CORR LB/HP-HR	MODAL WEIGHT FACTOR	MODE
1	15.94	14.55	10.53	**********		******	.0066	.0690	.096	.987	.0064	-3.7	.980	*****	.067	1
2	9.88	7.27	11.74	21.22	15.62	25.22	.0082	.0690	.118	.984	.0080	-2.5	.982	2.186	.080	2
3	1.65	3.36	15.61	.67	1.36	6.31	.0188	.0690	.272	.961	.0204	8.5	.983	.411	.080	3
4	1.01	2.56	19.55	.35	.88	6.74	.0285	.0690	.413	.942	.0310	8.8	.985	.350	.080	4
5	.65	3.67	23.75	.23	1.33	8.60	.0391	.0690	.567	.927	.0397	1.3	.989	.366	.080	5
6	.49	8.19	25.78	.17	2.82	8.87	.0441	.0690	.639	.915	.0465	5.5	.993	.346	.080	6
7	17.46	17.39	11.12	**********		******	.0066	.0690	.095	.988	.0060	-8.9	.982	*****	.067	7
8	1.44	1.64	26.07	.48	.54	8.69	.0286	.0690	.414	.942	.0310	8.4	1.025	.325	.080	8
9	1.47	1.25	22.01	.54	.46	8.04	.0267	.0690	.387	.948	.0273	2.3	1.015	.360	.080	9
10	1.88	1.46	16.95	.80	.62	7.18	.0237	.0690	.344	.955	.0235	-.8	1.007	.421	.080	10
11	3.77	3.54	12.66	1.89	1.77	6.33	.0165	.0690	.240	.966	.0178	7.4	.998	.501	.080	11
12	12.07	8.77	10.78	35.85	26.03	32.00	.0094	.0690	.136	.980	.0099	5.5	.993	2.991	.080	12
13	12.97	12.04	11.30	**********		******	.0066	.0690	.096	.986	.0067	2.0	.982	*****	.067	13

CYCLE COMPOSITE USING 13-MODE WEIGHT FACTORS

BSHC ------- =	.848	GRAM/BHP-HR
BSCO ------- =	1.436	GRAM/BHP-HR
BSNOX ------ =	8.264	GRAM/BHP-HR
BSHC + BSNOX =	9.112	GRAM/BHP-HR
CORR. BSFC - =	.391	LBS/BHP-HR

TABLE A-4. ENGINE EMISSION RESULTS
C-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D59
ENGINE MODEL 81 CUMMINS NTC-300
ENGINE 0.0 L(0. CID) I-6
CVS NO. 10

TEST NO.D59-3 RUN1
DATE 3/ 1/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 742.95 MM HG(29.25 IN HG)
DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)

RELATIVE HUMIDITY , ENGINE-49. PCT , CVS-39. PCT
ABSOLUTE HUMIDITY 8.9 GM/KG(62.2 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER	NYNF	LANF	LAF	NYNF
DESCRIPTION				
BLOWER DIF P MM. H2O(IN. H2O)	650.2 (25.6)	650.2 (25.6)	650.2 (25.6)	650.2 (25.6)
BLOWER INLET P MM. H2O(IN. H2O)	513.1 (20.2)	513.1 (20.2)	513.1 (20.2)	513.1 (20.2)
BLOWER INLET TEMP. DEG. C(DEG. F)	45.6 (114.0)	45.6 (114.0)	45.6 (114.0)	45.6 (114.0)
BLOWER REVOLUTIONS	6179.	6262.	6369.	6218.
TIME SECONDS	296.1	300.0	305.1	297.9
TOTAL FLOW STD. CU. METRES(SCF)	278.5 (9837.)	282.3 (9969.)	287.1 (10140.)	280.3 (9899.)
HC SAMPLE METER/RANGE/PPM	9.4/23/ 47.	11.8/23/ 59.	14.3/23/ 72.	10.0/23/ 50.
HC BCKGRD METER/RANGE/PPM	6.2/ 2/ 6.	6.1/ 2/ 6.	6.0/ 2/ 6.	5.0/ 2/ 5.
CO SAMPLE METER/RANGE/PPM	54.4/13/ 52.	47.9/13/ 45.	41.8/13/ 39.	52.7/13/ 50.
CO BCKGRD METER/RANGE/PPM	.1/13/ 0.	.1/13/ 0.	.1/13/ 0.	.5/13/ 0.
CO2 SAMPLE METER/RANGE/PCT	93.8/12/ .43	68.7/11/ .60	71.0/ 3/ 1.28	85.8/12/ .38
CO2 BCKGRD METER/RANGE/PCT	14.4/12/ .05	8.8/11/ .05	3.6/ 3/ .06	14.3/12/ .05
NOX SAMPLE METER/RANGE/PPM	31.4/ 2/ 31.	48.7/ 2/ 49.	47.9/ 3/ 144.	33.9/ 2/ 34.
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ 0.	.1/ 2/ 0.	.1/ 3/ 0.	.1/ 2/ 0.
DILUTION FACTOR	30.74	22.09	10.34	34.56
HC CONCENTRATION PPM	41.	53.	66.	45.
CO CONCENTRATION PPM	51.	44.	37.	49.
CO2 CONCENTRATION PCT	.38	.55	1.23	.33
NOX CONCENTRATION PPM	31.3	48.6	143.4	33.8
HC MASS GRAMS	6.58	8.66	10.94	7.26
CO MASS GRAMS	16.38	14.43	12.52	15.83
CO2 MASS GRAMS	1930.0	2820.2	6491.4	1695.2
NOX MASS GRAMS	16.68	26.24	78.77	18.12
FUEL KG (LB)	.621 (1.37)	.902 (1.99)	2.056 (4.53)	.548 (1.21)
KW HR (HP HR)	1.86 (2.50)	3.07 (4.12)	8.84 (11.85)	1.98 (2.66)
BSHC G/KW HR (G/HP HR)	3.53 (2.63)	2.82 (2.10)	1.24 (.92)	3.66 (2.73)
BSCO G/KW HR (G/HP HR)	8.79 (6.55)	4.70 (3.50)	1.42 (1.06)	7.98 (5.95)
BSCO2 G/KW HR (G/HP HR)	1035.27 (772.00)	917.95 (684.51)	734.61 (547.80)	854.64 (637.30)
BSNOX G/KW HR (G/HP HR)	8.95 (6.67)	8.54 (6.37)	8.91 (6.65)	9.14 (6.81)
BSFC KG/KW HR (LB/HP HR)	.333 (.548)	.294 (.483)	.233 (.383)	.276 (.454)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	15.76 (21.13)
BSHC G/KW HR (G/HP HR)	2.12 (1.58)
BSCO G/KW HR (G/HP HR)	3.75 (2.80)
BSCO2 G/KW HR (G/HP HR)	821. (612.)
BSNOX G/KW HR (G/HP HR)	8.87 (6.62)
BSFC KG/KW HR (LB/HP HR)	.262 (.431)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	11.01
	G/KWHR(G/HPHR)	.70 (.52)
	G/KG FUEL (G/LB FUEL)	2.67 (1.21)
	FILTER EFF.	96.8

TABLE A-4. ENGINE EMISSION RESULTS (Cont'd)
H-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D59
ENGINE MODEL 81 CUMMINS NTC-300
ENGINE 0.0 L(0. CID) I-6
CVS NO. 10

TEST NO.D59-3 RUN1
DATE 3/ 1/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 742.19 MM HG(29.22 IN HG)
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)

RELATIVE HUMIDITY , ENGINE-41. PCT , CVS-36. PCT
ABSOLUTE HUMIDITY 8.3 GM/KG(58.1 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER				
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	647.7 (25.5)	647.7 (25.5)	647.7 (25.5)	647.7 (25.5)
BLOWER INLET P MM. H2O(IN. H2O)	513.1 (20.2)	513.1 (20.2)	513.1 (20.2)	513.1 (20.2)
BLOWER INLET TEMP. DEG. C(DEG. F)	45.6 (114.0)	45.6 (114.0)	45.6 (114.0)	45.6 (114.0)
BLOWER REVOLUTIONS	6180.	6262.	6368.	6218.
TIME SECONDS	296.1	300.0	305.1	297.9
TOTAL FLOW STD. CU. METRES(SCF)	278.3 (9829.)	282.0 (9959.)	286.7 (10128.)	280.0 (9889.)
HC SAMPLE METER/RANGE/PPM	7.7/23/ 39.	11.5/23/ 57.	12.4/23/ 62.	8.7/23/ 44.
HC BCKGRD METER/RANGE/PPM	5.0/ 2/ 5.	5.0/ 2/ 5.	5.4/ 2/ 5.	5.8/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	55.6/13/ 53.	54.5/13/ 52.	40.9/13/ 38.	49.9/13/ 47.
CO BCKGRD METER/RANGE/PPM	1.0/13/ 1.	.4/13/ 0.	.5/13/ 0.	.6/13/ 1.
CO2 SAMPLE METER/RANGE/PCT	87.1/12/ .39	65.9/11/ .56	70.0/ 3/ 1.26	85.5/12/ .38
CO2 BCKGRD METER/RANGE/PCT	14.3/12/ .05	8.1/11/ .05	3.4/ 3/ .05	14.2/12/ .05
NOX SAMPLE METER/RANGE/PPM	34.0/ 2/ 34.	56.0/ 2/ 56.	53.1/ 3/ 159.	36.4/ 2/ 36.
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ 0.	.4/ 2/ 0.	.1/ 3/ 0.	.5/ 2/ 1.
DILUTION FACTOR	33.97	23.36	10.52	34.80
HC CONCENTRATION PPM	34.	53.	57.	38.
CO CONCENTRATION PPM	51.	50.	36.	46.
CO2 CONCENTRATION PCT	.34	.52	1.22	.33
NOX CONCENTRATION PPM	33.6	55.6	159.0	35.9
HC MASS GRAMS	5.43	8.55	9.46	6.12
CO MASS GRAMS	16.54	16.51	12.13	14.89
CO2 MASS GRAMS	1722.0	2665.8	6391.0	1686.3
NOX MASS GRAMS	17.89	30.00	87.23	19.24
FUEL KG (LB)	.555 (1.22)	.854 (1.88)	2.023 (4.46)	.543 (1.20)
KW HR (HP HR)	1.96 (2.63)	3.15 (4.23)	8.84 (11.85)	1.97 (2.64)
BSHC G/KW HR (G/HP HR)	2.77 (2.06)	2.71 (2.02)	1.07 (.80)	3.11 (2.32)
BSCO G/KW HR (G/HP HR)	8.43 (6.29)	5.23 (3.90)	1.37 (1.02)	7.56 (5.64)
BSCO2 G/KW HR (G/HP HR)	878.06 (654.77)	845.12 (630.21)	723.24 (539.32)	856.58 (638.75)
BSNOX G/KW HR (G/HP HR)	9.12 (6.80)	9.51 (7.09)	9.87 (7.36)	9.77 (7.29)
BSFC KG/KW HR (LB/HP HR)	.283 (.465)	.271 (.445)	.229 (.376)	.276 (.454)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	15.92 (21.35)
BSHC G/KW HR (G/HP HR)	1.86 (1.38)
BSCO G/KW HR (G/HP HR)	3.77 (2.81)
BSCO2 G/KW HR (G/HP HR)	783. (584.)
BSNOX G/KW HR (G/HP HR)	9.70 (7.23)
BSFC KG/KW HR (LB/HP HR)	.250 (.410)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	9.90
	G/KWHR(G/HPHR)	.62 (.46)
	G/KG FUEL (G/LB FUEL)	2.49 (1.13)
	FILTER EFF.	95.3

TABLE A-5. ENGINE EMISSION RESULTS CONTINUOUS NO_x
C-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D59
ENGINE MODEL 81 CUMMINS NTC-300
ENGINE 0.0 L(0. CID) I-6
CVS NO. 10

TEST NO.D59-3 RUN1
DATE 3/ 1/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 742.95 MM HG(29.25 IN HG)
DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)

RELATIVE HUMIDITY , ENGINE-49. PCT , CVS-39. PCT
ABSOLUTE HUMIDITY 8.9 GM/KG(62.2 GRAINS/LB) NOX HUMIDITY C.F. 1.0000

BAG RESULTS

BAG NUMBER	1	2	3	4
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	650.2 (25.6)	650.2 (25.6)	650.2 (25.6)	650.2 (25.6)
BLOWER INLET P MM. H2O(IN. H2O)	513.1 (20.2)	513.1 (20.2)	513.1 (20.2)	513.1 (20.2)
BLOWER INLET TEMP. DEG. C(DEG. F)	45.6 (114.0)	45.6 (114.0)	45.6 (114.0)	45.6 (114.0)
BLOWER REVOLUTIONS	6179.	6262.	6369.	6218.
TIME SECONDS	296.1	300.0	305.1	297.9
TOTAL FLOW STD. CU. METRES(SCF)	278.5 (9837.)	282.3 (9969.)	287.1 (10140.)	280.3 (9899.)
HC SAMPLE METER/RANGE/PPM	9.4/23/ 47.	11.8/23/ 59.	14.3/23/ 72.	10.0/23/ 50.
HC BCKGRD METER/RANGE/PPM	6.2/ 2/ 6.	6.1/ 2/ 6.	6.0/ 2/ 6.	5.0/ 2/ 5.
CO SAMPLE METER/RANGE/PPM	54.4/13/ 52.	47.9/13/ 45.	41.8/13/ 39.	52.7/13/ 50.
CO BCKGRD METER/RANGE/PPM	.1/13/ 0.	.1/13/ 0.	.1/13/ 0.	.5/13/ 0.
CO2 SAMPLE METER/RANGE/PCT	93.8/12/ .43	68.7/11/ .60	71.0/ 3/ 1.28	85.8/12/ .38
CO2 BCKGRD METER/RANGE/PCT	14.4/12/ .05	8.8/11/ .05	3.6/ 3/ .06	14.3/12/ .05
NOX SAMPLE METER/RANGE/PPM	3.7/14/ 37.	5.7/14/ 57.	17.5/14/ 175.	4.1/14/ 41.
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ 0.	.1/ 2/ 0.	.1/ 3/ 0.	.1/ 2/ 0.
DILUTION FACTOR	30.74	22.09	10.34	34.56
HC CONCENTRATION PPM	41.	53.	66.	45.
CO CONCENTRATION PPM	51.	44.	37.	49.
CO2 CONCENTRATION PCT	.38	.55	1.23	.33
NOX CONCENTRATION PPM	36.7	56.0	170.1	40.3
HC MASS GRAMS	6.58	8.66	10.94	7.26
CO MASS GRAMS	16.38	14.43	12.52	15.83
CO2 MASS GRAMS	1930.0	2820.2	6491.4	1695.2
NOX MASS GRAMS	19.57	30.24	93.42	21.63
FUEL KG (LB)	.621 (1.37)	.902 (1.99)	2.056 (4.53)	.548 (1.21)
KW HR (HP HR)	1.86 (2.50)	3.07 (4.12)	8.84 (11.85)	1.98 (2.66)
BSHC G/KW HR (G/HP HR)	3.53 (2.63)	2.82 (2.10)	1.24 (.92)	3.66 (2.73)
BSCO G/KW HR (G/HP HR)	8.79 (6.55)	4.70 (3.50)	1.42 (1.06)	7.98 (5.95)
BSCO2 G/KW HR (G/HP HR)	1035.27 (772.00)	917.95 (684.51)	734.61 (547.80)	854.64 (637.30)
BSNOX G/KW HR (G/HP HR)	10.50 (7.83)	9.84 (7.34)	10.57 (7.88)	10.90 (8.13)
BSFC KG/KW HR (LB/HP HR)	.333 (.548)	.294 (.483)	.233 (.383)	.276 (.454)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	15.76 (21.13)	
BSHC G/KW HR (G/HP HR)	2.12 (1.58)	
BSCO G/KW HR (G/HP HR)	3.75 (2.80)	
BSCO2 G/KW HR (G/HP HR)	821. (612.)	
BSNOX G/KW HR (G/HP HR)	10.46 (7.80)	(Continuous)
BSFC KG/KW HR (LB/HP HR)	.262 (.431)	

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES

GRAMS/TEST	11.01
G/KWHR(G/HPHR)	.70 (.52)
G/KG FUEL (G/LB FUEL)	2.67 (1.21)
FILTER EFF.	96.8

TABLE A-5. ENGINE EMISSION RESULTS CONTINUOUS NO_X (Cont'd)
H-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D59
ENGINE MODEL 81 CUMMINS NTC-300
ENGINE 0.0 L(0. CID) I-6
CVS NO. 10

TEST NO.D59-3 RUN1
DATE 3/ 1/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 742.19 MM HG(29.22 IN HG)
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)

RELATIVE HUMIDITY , ENGINE-41. PCT , CVS-36. PCT
ABSOLUTE HUMIDITY 8.3 GM/KG(58.1 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER				
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	647.7 (25.5)	647.7 (25.5)	647.7 (25.5)	647.7 (25.5)
BLOWER INLET P MM. H2O(IN. H2O)	513.1 (20.2)	513.1 (20.2)	513.1 (20.2)	513.1 (20.2)
BLOWER INLET TEMP. DEG. C(DEG. F)	45.6 (114.0)	45.6 (114.0)	45.6 (114.0)	45.6 (114.0)
BLOWER REVOLUTIONS	6180.	6262.	6368.	6218.
TIME SECONDS	296.1	300.0	305.1	297.9
TOTAL FLOW STD. CU. METRES(SCF)	278.3 (9829.)	282.0 (9959.)	286.7 (10128.)	280.0 (9889.)
HC SAMPLE METER/RANGE/PPM	7.7/23/ 39.	11.5/23/ 57.	12.4/23/ 62.	8.7/23/ 44.
HC BCKGRD METER/RANGE/PPM	5.0/ 2/ 5.	5.0/ 2/ 5.	5.4/ 2/ 5.	5.8/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	55.6/13/ 53.	54.5/13/ 52.	40.9/13/ 38.	49.9/13/ 47.
CO BCKGRD METER/RANGE/PPM	1.0/13/ 1.	.4/13/ 0.	.5/13/ 0.	.6/13/ 1.
CO2 SAMPLE METER/RANGE/PCT	87.1/12/ .39	65.9/11/ .56	70.0/ 3/ 1.26	85.5/12/ .38
CO2 BCKGRD METER/RANGE/PCT	14.3/12/ .05	8.1/11/ .05	3.4/ 3/ .05	14.2/12/ .05
NOX SAMPLE METER/RANGE/PPM	4.0/14/ 40.	6.5/14/ 65.	19.2/14/ 192.	4.3/14/ 43.
NOX BCKGRD METER/RANGE/PPM	.4/ 2/ 0.	.4/ 2/ 0.	.1/ 3/ 0.	.5/ 2/ 1.
DILUTION FACTOR	33.97	23.36	10.52	34.80
HC CONCENTRATION PPM	34.	53.	57.	38.
CO CONCENTRATION PPM	51.	50.	36.	46.
CO2 CONCENTRATION PCT	.34	.52	1.22	.33
NOX CONCENTRATION PPM	39.4	63.8	186.9	41.9
HC MASS GRAMS	5.43	8.55	9.46	6.12
CO MASS GRAMS	16.54	16.51	12.13	14.89
CO2 MASS GRAMS	1722.0	2665.8	6391.0	1686.3
NOX MASS GRAMS	20.96	34.42	102.52	22.44
FUEL KG (LB)	.555 (1.22)	.854 (1.88)	2.023 (4.46)	.543 (1.20)
KW HR (HP HR)	1.96 (2.63)	3.15 (4.23)	8.84 (11.85)	1.97 (2.64)
BSHC G/KW HR (G/HP HR)	2.77 (2.06)	2.71 (2.02)	1.07 (.80)	3.11 (2.32)
BSCO G/KW HR (G/HP HR)	8.43 (6.29)	5.23 (3.90)	1.37 (1.02)	7.56 (5.64)
BSCO2 G/KW HR (G/HP HR)	878.06 (654.77)	845.12 (630.21)	723.24 (539.32)	856.58 (638.75)
BSNOX G/KW HR (G/HP HR)	10.69 (7.97)	10.91 (8.14)	11.60 (8.65)	11.40 (8.50)
BSFC KG/KW HR (LB/HP HR)	.283 (.465)	.271 (.445)	.229 (.376)	.276 (.454)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	15.92 (21.35)	
BSHC G/KW HR (G/HP HR)	1.86 (1.38)	
BSCO G/KW HR (G/HP HR)	3.77 (2.81)	
BSCO2 G/KW HR (G/HP HR)	783. (584.)	
BSNOX G/KW HR (G/HP HR)	11.33 (8.45)	(Continuous)
BSFC KG/KW HR (LB/HP HR)	.250 (.410)	

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES

GRAMS/TEST	9.90
G/KWHR(G/HPHR)	.62 (.46)
G/KG FUEL (G/LB FUEL)	2.49 (1.13)
FILTER EFF.	95.3

TABLE A-6. ENGINE EMISSION RESULTS
C-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D59
ENGINE MODEL 81 CUMMINS NTC-300
ENGINE 0.0 L(0. CID) I-6
CVS NO. 10

TEST NO.D59-4 RUN1
DATE 3/ 2/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 740.41 MM HG(29.15 IN HG)
DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)

RELATIVE HUMIDITY , ENGINE-49. PCT , CVS-46. PCT
ABSOLUTE HUMIDITY 8.6 GM/KG(60.3 GRAINS/LB) NOX HUMIDITY C.F. 1.0000

BAG RESULTS

BAG NUMBER	1	2	3	4
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	647.7 (25.5)	647.7 (25.5)	647.7 (25.5)	647.7 (25.5)
BLOWER INLET P MM. H2O(IN. H2O)	508.0 (20.0)	508.0 (20.0)	508.0 (20.0)	508.0 (20.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)
BLOWER REVOLUTIONS	6177.	6264.	6386.	6217.
TIME SECONDS	296.0	300.1	305.1	298.0
TOTAL FLOW STD. CU. METRES(SCF)	277.3 (9796.)	281.3 (9934.)	286.8 (10129.)	279.1 (9859.)
HC SAMPLE METER/RANGE/PPM	9.2/23/ 46.	12.3/23/ 62.	14.3/23/ 72.	9.7/23/ 49.
HC BCKGRD METER/RANGE/PPM	8.3/ 2/ 8.	8.0/ 2/ 8.	6.3/ 2/ 6.	5.5/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	49.5/13/ 47.	48.7/13/ 46.	40.0/13/ 37.	47.0/13/ 44.
CO BCKGRD METER/RANGE/PPM	.1/13/ 0.	.1/13/ 0.	.2/13/ 0.	.2/13/ 0.
CO2 SAMPLE METER/RANGE/PCT	98.3/12/ .45	67.6/11/ .58	70.0/ 3/ 1.26	85.1/12/ .37
CO2 BCKGRD METER/RANGE/PCT	16.7/12/ .06	9.3/11/ .06	3.4/ 3/ .05	14.9/12/ .05
NOX SAMPLE METER/RANGE/PPM	32.7/ 2/ 33.	47.9/ 2/ 48.	48.2/ 3/ 145.	34.0/ 2/ 34.
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ 0.	.4/ 2/ 0.	.1/ 3/ 0.	.2/ 2/ 0.
DILUTION FACTOR	28.87	22.57	10.51	34.99
HC CONCENTRATION PPM	38.	54.	66.	43.
CO CONCENTRATION PPM	45.	45.	36.	43.
CO2 CONCENTRATION PCT	.40	.53	1.22	.32
NOX CONCENTRATION PPM	32.6	47.5	144.3	33.8
HC MASS GRAMS	6.11	8.76	10.88	6.96
CO MASS GRAMS	14.69	14.60	11.89	13.98
CO2 MASS GRAMS	2027.9	2725.8	6391.9	1656.7
NOX MASS GRAMS	17.30	25.57	79.18	18.05
FUEL KG (LB)	.650 (1.43)	.872 (1.92)	2.025 (4.46)	.534 (1.18)
KW HR (HP HR)	1.81 (2.43)	2.98 (4.00)	8.79 (11.79)	1.95 (2.61)
BSHC G/KW HR (G/HP HR)	3.37 (2.51)	2.94 (2.19)	1.24 (.92)	3.58 (2.67)
BSCO G/KW HR (G/HP HR)	8.11 (6.04)	4.89 (3.65)	1.35 (1.01)	7.18 (5.36)
BSCO2 G/KW HR (G/HP HR)	1119.10 (834.52)	913.83 (681.44)	727.02 (542.14)	851.21 (634.75)
BSNOX G/KW HR (G/HP HR)	9.55 (7.12)	8.57 (6.39)	9.01 (6.72)	9.27 (6.92)
BSFC KG/KW HR (LB/HP HR)	.359 (.590)	.292 (.481)	.230 (.379)	.275 (.451)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	15.53 (20.83)
BSHC G/KW HR (G/HP HR)	2.11 (1.57)
BSCO G/KW HR (G/HP HR)	3.55 (2.65)
BSCO2 G/KW HR (G/HP HR)	824. (615.)
BSNOX G/KW HR (G/HP HR)	9.02 (6.73)
BSFC KG/KW HR (LB/HP HR)	.263 (.432)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES GRAMS/TEST	10.26
G/KWHR(G/HPHR)	.66 (.49)
G/KG FUEL (G/LB FUEL)	2.51 (1.14)
FILTER EFF.	96.6

TABLE A-6. ENGINE EMISSION RESULTS (Cont'd)
H-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D59
ENGINE MODEL 81 CUMMINS NTC-300
ENGINE 0.0 L(0. CID) I-6
CVS NO. 10

TEST NO.D59-4 RUN1
DATE 3/ 2/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 739.39 MM HG(29.11 IN HG)
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)

RELATIVE HUMIDITY , ENGINE-40. PCT , CVS-42. PCT
ABSOLUTE HUMIDITY 8.1 GM/KG(56.9 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER				
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	645.2 (25.4)	645.2 (25.4)	645.2 (25.4)	645.2 (25.4)
BLOWER INLET P MM. H2O(IN. H2O)	510.5 (20.1)	510.5 (20.1)	510.5 (20.1)	510.5 (20.1)
BLOWER INLET TEMP. DEG. C(DEG. F)	47.2 (117.0)	47.2 (117.0)	47.2 (117.0)	47.2 (117.0)
BLOWER REVOLUTIONS	6180.	6261.	6367.	6217.
TIME SECONDS	296.1	299.9	305.0	297.9
TOTAL FLOW STD. CU. METRES(SCF)	276.5 (9768.)	280.2 (9896.)	284.9 (10063.)	278.2 (9826.)
HC SAMPLE METER/RANGE/PPM	7.3/23/ 36.	10.8/23/ 54.	12.2/23/ 61.	7.3/23/ 36.
HC BCKGRD METER/RANGE/PPM	5.3/ 2/ 5.	6.2/ 2/ 6.	6.6/ 2/ 7.	6.1/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	55.4/13/ 53.	51.8/13/ 49.	38.8/13/ 36.	45.9/13/ 43.
CO BCKGRD METER/RANGE/PPM	.6/13/ 1.	.5/13/ 0.	.6/13/ 1.	.5/13/ 0.
CO2 SAMPLE METER/RANGE/PCT	89.1/12/ .40	66.5/11/ .57	71.3/ 3/ 1.29	87.4/12/ .39
CO2 BCKGRD METER/RANGE/PCT	18.9/12/ .07	10.9/11/ .07	4.4/ 3/ .07	18.3/12/ .06
NOX SAMPLE METER/RANGE/PPM	33.5/ 2/ 34.	55.3/ 2/ 55.	53.5/ 3/ 161.	35.5/ 2/ 36.
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ 0.	.4/ 2/ 0.	.1/ 3/ 0.	.4/ 2/ 0.
DILUTION FACTOR	33.00	23.10	10.31	33.92
HC CONCENTRATION PPM	31.	48.	55.	30.
CO CONCENTRATION PPM	51.	47.	34.	42.
CO2 CONCENTRATION PCT	.33	.51	1.23	.33
NOX CONCENTRATION PPM	33.2	54.9	160.2	35.1
HC MASS GRAMS	5.00	7.73	9.03	4.87
CO MASS GRAMS	16.44	15.46	11.34	13.51
CO2 MASS GRAMS	1688.6	2596.5	6416.0	1658.0
NOX MASS GRAMS	17.57	29.43	87.33	18.69
FUEL KG (LB)	.544 (1.20)	.831 (1.83)	2.030 (4.48)	.532 (1.17)
KW HR (HP HR)	1.95 (2.61)	3.12 (4.18)	8.81 (11.82)	1.95 (2.62)
BSHC G/KW HR (G/HP HR)	2.57 (1.91)	2.48 (1.85)	1.02 (.76)	2.49 (1.86)
BSCO G/KW HR (G/HP HR)	8.45 (6.30)	4.96 (3.70)	1.29 (.96)	6.92 (5.16)
BSCO2 G/KW HR (G/HP HR)	867.60 (646.97)	833.02 (621.18)	727.92 (542.81)	848.62 (632.81)
BSNOX G/KW HR (G/HP HR)	9.03 (6.73)	9.44 (7.04)	9.91 (7.39)	9.56 (7.13)
BSFC KG/KW HR (LB/HP HR)	.279 (.459)	.267 (.438)	.230 (.379)	.273 (.448)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES

GRAMS/TEST	8.77
G/KWHR(G/HPHR)	.55 (.41)
G/KG FUEL (G/LB FUEL)	2.23 (1.01)
FILTER EFF.	96.4

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	15.83 (21.23)
BSHC G/KW HR (G/HP HR)	1.68 (1.25)
BSCO G/KW HR (G/HP HR)	3.58 (2.67)
BSCO2 G/KW HR (G/HP HR)	781. (582.)
BSNOX G/KW HR (G/HP HR)	9.67 (7.21)
BSFC KG/KW HR (LB/HP HR)	.249 (.409)

TABLE A-7. ENGINE EMISSION RESULTS CONTINUOUS NO_x
C-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D59
ENGINE MODEL 81 CUMMINS NTC-300
ENGINE 0.0 L(0. CID) I-6
CVS NO. 10

TEST NO.D59-4 RUN1
DATE 3/ 2/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 740.41 MM HG(29.15 IN HG)
DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)

RELATIVE HUMIDITY , ENGINE-49. PCT , CVS-46. PCT
ABSOLUTE HUMIDITY 8.6 GM/KG(60.3 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER	1	2	3	4
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	647.7 (25.5)	647.7 (25.5)	647.7 (25.5)	647.7 (25.5)
BLOWER INLET P MM. H2O(IN. H2O)	508.0 (20.0)	508.0 (20.0)	508.0 (20.0)	508.0 (20.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)
BLOWER REVOLUTIONS	6177.	6264.	6386.	6217.
TIME SECONDS	296.0	300.1	305.1	298.0
TOTAL FLOW STD. CU. METRES(SCF)	277.3 (9796.)	281.3 (9934.)	286.8 (10129.)	279.1 (9859.)
HC SAMPLE METER/RANGE/PPM	9.2/23/ 46.	12.3/23/ 62.	14.3/23/ 72.	9.7/23/ 49.
HC BCKGRD METER/RANGE/PPM	8.3/ 2/ 8.	8.0/ 2/ 8.	6.3/ 2/ 6.	5.5/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	49.5/13/ 47.	48.7/13/ 46.	40.0/13/ 37.	47.0/13/ 44.
CO BCKGRD METER/RANGE/PPM	.1/13/ 0.	.1/13/ 0.	.2/13/ 0.	.2/13/ 0.
CO2 SAMPLE METER/RANGE/PCT	98.3/12/ .45	67.6/11/ .58	70.0/ 3/ 1.26	85.1/12/ .37
CO2 BCKGRD METER/RANGE/PCT	16.7/12/ .06	9.3/11/ .06	3.4/ 3/ .05	14.9/12/ .05
NOX SAMPLE METER/RANGE/PPM	3.6/14/ 36.	5.4/14/ 54.	17.4/14/ 174.	3.9/14/ 39.
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ 0.	.4/ 2/ 0.	.1/ 3/ 0.	.2/ 2/ 0.
DILUTION FACTOR	28.87	22.57	10.51	34.99
HC CONCENTRATION PPM	38.	54.	66.	43.
CO CONCENTRATION PPM	45.	45.	36.	43.
CO2 CONCENTRATION PCT	.40	.53	1.22	.32
NOX CONCENTRATION PPM	35.2	52.7	169.3	37.8
HC MASS GRAMS	6.11	8.76	10.88	6.96
CO MASS GRAMS	14.69	14.60	11.89	13.98
CO2 MASS GRAMS	2027.9	2725.8	6391.9	1656.7
NOX MASS GRAMS	18.68	28.38	92.86	20.16
FUEL KG (LB)	.650 (1.43)	.872 (1.92)	2.025 (4.46)	.534 (1.18)
KW HR (HP HR)	1.81 (2.43)	2.98 (4.00)	8.79 (11.79)	1.95 (2.61)
BSHC G/KW HR (G/HP HR)	3.37 (2.51)	2.94 (2.19)	1.24 (.92)	3.58 (2.67)
BSCO G/KW HR (G/HP HR)	8.11 (6.04)	4.89 (3.65)	1.35 (1.01)	7.18 (5.36)
BSCO2 G/KW HR (G/HP HR)	1119.10 (834.52)	913.83 (681.44)	727.02 (542.14)	851.21 (634.75)
BSNOX G/KW HR (G/HP HR)	10.31 (7.69)	9.51 (7.09)	10.56 (7.88)	10.36 (7.72)
BSFC KG/KW HR (LB/HP HR)	.359 (.590)	.292 (.481)	.230 (.379)	.275 (.451)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	15.53 (20.83)
BSHC G/KW HR (G/HP HR)	2.11 (1.57)
BSCO G/KW HR (G/HP HR)	3.55 (2.65)
BSCO2 G/KW HR (G/HP HR)	824. (615.)
BSNOX G/KW HR (G/HP HR)	10.31 (7.68)
BSFC KG/KW HR (LB/HP HR)	.263 (.432)

(Continuous)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	
GRAMS/TEST	10.26
G/KWHR(G/HPHR)	.66 (.49)
G/KG FUEL (G/LB FUEL)	2.51 (1.14)
FILTER EFF.	96.6

TABLE A-7. ENGINE EMISSION RESULTS CONTINUOUS NO_x (Cont'd)
H-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D59
ENGINE MODEL 81 CUMMINS NTC-300
ENGINE 0.0 L(0. CID) I-6
CVS NO. 10

TEST NO.D59-4 RUN1
DATE 3/ 2/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 739.39 MM HG(29.11 IN HG)
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)

RELATIVE HUMIDITY , ENGINE-40. PCT , CVS-42. PCT
ABSOLUTE HUMIDITY 8.1 GM/KG(56.9 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER	1	2	3	4
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	645.2 (25.4)	645.2 (25.4)	645.2 (25.4)	645.2 (25.4)
BLOWER INLET P MM. H2O(IN. H2O)	510.5 (20.1)	510.5 (20.1)	510.5 (20.1)	510.5 (20.1)
BLOWER INLET TEMP. DEG. C(DEG. F)	47.2 (117.0)	47.2 (117.0)	47.2 (117.0)	47.2 (117.0)
BLOWER REVOLUTIONS	6180.	6261.	6367.	6217.
TIME SECONDS	296.1	299.9	305.0	297.9
TOTAL FLOW STD. CU. METRES(SCF)	276.5 (9768.)	280.2 (9896.)	284.9 (10063.)	278.2 (9826.)
HC SAMPLE METER/RANGE/PPM	7.3/23/ 36.	10.8/23/ 54.	12.2/23/ 61.	7.3/23/ 36.
HC BCKGRD METER/RANGE/PPM	5.3/ 2/ 5.	6.2/ 2/ 6.	6.6/ 2/ 7.	6.1/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	55.4/13/ 53.	51.8/13/ 49.	38.8/13/ 36.	45.9/13/ 43.
CO BCKGRD METER/RANGE/PPM	.6/13/ 1.	.5/13/ 0.	.6/13/ 1.	.5/13/ 0.
CO2 SAMPLE METER/RANGE/PCT	89.1/12/ .40	66.5/11/ .57	71.3/ 3/ 1.29	87.4/12/ .39
CO2 BCKGRD METER/RANGE/PCT	18.9/12/ .07	10.9/11/ .07	4.4/ 3/ .07	18.3/12/ .06
NOX SAMPLE METER/RANGE/PPM	3.6/14/ 36.	6.1/14/ 61.	18.6/14/ 186.	4.0/14/ 40.
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ 0.	.4/ 2/ 0.	.1/ 3/ 0.	.4/ 2/ 0.
DILUTION FACTOR	33.00	23.10	10.31	33.92
HC CONCENTRATION PPM	31.	48.	55.	30.
CO CONCENTRATION PPM	51.	47.	34.	42.
CO2 CONCENTRATION PCT	.33	.51	1.23	.33
NOX CONCENTRATION PPM	35.6	59.0	180.5	39.0
HC MASS GRAMS	5.00	7.73	9.03	4.87
CO MASS GRAMS	16.44	15.46	11.34	13.51
CO2 MASS GRAMS	1688.6	2596.5	6416.0	1658.0
NOX MASS GRAMS	18.81	31.61	98.40	20.78
FUEL KG (LB)	.544 (1.20)	.831 (1.83)	2.030 (4.48)	.532 (1.17)
KW HR (HP HR)	1.95 (2.61)	3.12 (4.18)	8.81 (11.82)	1.95 (2.62)
BSHC G/KW HR (G/HP HR)	2.57 (1.91)	2.48 (1.85)	1.02 (.76)	2.49 (1.86)
BSCO G/KW HR (G/HP HR)	8.45 (6.30)	4.96 (3.70)	1.29 (.96)	6.92 (5.16)
BSCO2 G/KW HR (G/HP HR)	867.60 (646.97)	833.02 (621.18)	727.92 (542.81)	848.62 (632.81)
BSNOX G/KW HR (G/HP HR)	9.66 (7.21)	10.14 (7.56)	11.16 (8.33)	10.64 (7.93)
BSFC KG/KW HR (LB/HP HR)	.279 (.459)	.267 (.438)	.230 (.379)	.273 (.448)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	15.83 (21.23)
BSHC G/KW HR (G/HP HR)	1.68 (1.25)
BSCO G/KW HR (G/HP HR)	3.58 (2.67)
BSCO2 G/KW HR (G/HP HR)	781. (582.)
BSNOX G/KW HR (G/HP HR)	10.71 (7.99)(Continuous)
BSFC KG/KW HR (LB/HP HR)	.249 (.409)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	8.77
	G/KWHR(G/HPHR)	.55 (.41)
	G/KG FUEL (G/LB FUEL)	2.23 (1.01)
	FILTER EFF.	96.4

TABLE A-8. ENGINE EMISSION RESULTS
C-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D59
ENGINE MODEL 81 CUMMINS NTC-300
ENGINE 0.0 L(0. CID) I-6
CVS NO. 10

TEST NO.D59-5 RUN1
DATE 3/ 5/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 740.66 MM HG(29.16 IN HG)
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)

RELATIVE HUMIDITY , ENGINE-46. PCT , CVS-32. PCT
ABSOLUTE HUMIDITY 8.6 GM/KG(60.5 GRAINS/LB) NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER	NYNF	LANF	LAF	NYNF
DESCRIPTION				
BLOWER DIF P MM. H2O(IN. H2O)	642.6 (25.3)	642.6 (25.3)	642.6 (25.3)	642.6 (25.3)
BLOWER INLET P MM. H2O(IN. H2O)	510.5 (20.1)	510.5 (20.1)	510.5 (20.1)	510.5 (20.1)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.7 (116.0)	46.7 (116.0)	46.7 (116.0)	46.7 (116.0)
BLOWER REVOLUTIONS	6183.	6265.	6370.	6226.
TIME SECONDS	296.2	300.1	305.1	298.1
TOTAL FLOW STD. CU. METRES(SCF)	277.5 (9801.)	281.2 (9931.)	285.9 (10097.)	279.4 (9869.)
HC SAMPLE METER/RANGE/PPM	9.7/23/ 49.	11.8/23/ 59.	13.4/23/ 67.	9.2/23/ 46.
HC BCKGRD METER/RANGE/PPM	5.0/ 2/ 5.	4.9/ 2/ 5.	5.2/ 2/ 5.	5.0/ 2/ 5.
CO SAMPLE METER/RANGE/PPM	53.2/13/ 50.	48.3/13/ 45.	41.3/13/ 38.	48.6/13/ 46.
CO BCKGRD METER/RANGE/PPM	.1/13/ 0.	.5/13/ 0.	.3/13/ 0.	.3/13/ 0.
CO2 SAMPLE METER/RANGE/PCT	95.0/12/ .43	68.3/11/ .59	70.2/ 3/ 1.27	87.9/12/ .39
CO2 BCKGRD METER/RANGE/PCT	19.3/12/ .07	10.3/11/ .06	4.0/ 3/ .06	17.2/12/ .06
NOX SAMPLE METER/RANGE/PPM	30.5/ 2/ 31.	47.6/ 2/ 48.	48.0/ 3/ 144.	35.0/ 2/ 35.
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ 0.	.3/ 2/ 0.	.1/ 3/ 0.	.4/ 2/ 0.
DILUTION FACTOR	30.21	22.26	10.48	33.56
HC CONCENTRATION PPM	44.	54.	62.	41.
CO CONCENTRATION PPM	49.	44.	37.	45.
CO2 CONCENTRATION PCT	.37	.53	1.21	.33
NOX CONCENTRATION PPM	30.4	47.3	143.7	34.6
HC MASS GRAMS	7.01	8.77	10.28	6.65
CO MASS GRAMS	15.97	14.42	12.29	14.54
CO2 MASS GRAMS	1872.7	2736.6	6349.2	1700.8
NOX MASS GRAMS	16.14	25.45	78.60	18.50
FUEL KG (LB)	.603 (1.33)	.876 (1.93)	2.011 (4.43)	.548 (1.21)
KW HR (HP HR)	1.77 (2.37)	2.95 (3.95)	8.81 (11.81)	1.93 (2.59)
BSHC G/KW HR (G/HP HR)	3.96 (2.96)	2.98 (2.22)	1.17 (.87)	3.44 (2.57)
BSCO G/KW HR (G/HP HR)	9.03 (6.74)	4.90 (3.65)	1.40 (1.04)	7.53 (5.61)
BSCO2 G/KW HR (G/HP HR)	1059.64 (790.18)	929.06 (692.80)	720.94 (537.61)	880.60 (656.66)
BSNOX G/KW HR (G/HP HR)	9.13 (6.81)	8.64 (6.44)	8.93 (6.66)	9.58 (7.14)
BSFC KG/KW HR (LB/HP HR)	.341 (.561)	.297 (.489)	.228 (.375)	.284 (.467)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	15.45 (20.72)
BSHC G/KW HR (G/HP HR)	2.12 (1.58)
BSCO G/KW HR (G/HP HR)	3.70 (2.76)
BSCO2 G/KW HR (G/HP HR)	819. (611.)
BSNOX G/KW HR (G/HP HR)	8.98 (6.69)
BSFC KG/KW HR (LB/HP HR)	.261 (.430)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	11.43
	G/KWHR(G/HPHR)	.74 (.55)
	G/KG FUEL (G/LB FUEL)	2.83 (1.28)
	FILTER EFF.	96.2

TABLE A-8. ENGINE EMISSION RESULTS (Cont'd)
H-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D59
ENGINE MODEL 81 CUMMINS NTC-300
ENGINE 0.0 L(0. CID) I-6
CVS NO. 10

TEST NO.D59-5 RUN1
DATE 3/ 5/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 740.66 MM HG(29.16 IN HG)
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)

RELATIVE HUMIDITY , ENGINE-44. PCT , CVS-62. PCT
ABSOLUTE HUMIDITY 8.6 GM/KG(60.5 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER				
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	650.2 (25.6)	650.2 (25.6)	650.2 (25.6)	650.2 (25.6)
BLOWER INLET P MM. H2O(IN. H2O)	513.1 (20.2)	513.1 (20.2)	513.1 (20.2)	513.1 (20.2)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.7 (116.0)	46.7 (116.0)	46.7 (116.0)	46.7 (116.0)
BLOWER REVOLUTIONS	6180.	6264.	6370.	6222.
TIME SECONDS	296.1	300.2	305.1	298.1
TOTAL FLOW STD. CU. METRES(SCF)	277.2 (9790.)	280.9 (9923.)	285.7 (10091.)	279.1 (9856.)
HC SAMPLE METER/RANGE/PPM	7.1/23/ 35.	10.9/23/ 54.	11.9/23/ 59.	8.6/23/ 43.
HC BCKGRD METER/RANGE/PPM	5.0/ 2/ 5.	5.2/ 2/ 5.	4.8/ 2/ 5.	3.8/ 2/ 4.
CO SAMPLE METER/RANGE/PPM	48.7/13/ 46.	52.0/13/ 49.	38.2/13/ 35.	46.2/13/ 43.
CO BCKGRD METER/RANGE/PPM	.1/13/ 0.	.1/13/ 0.	.2/13/ 0.	.2/13/ 0.
CO2 SAMPLE METER/RANGE/PCT	87.1/12/ .39	65.7/11/ .56	70.0/ 3/ 1.26	84.7/12/ .37
CO2 BCKGRD METER/RANGE/PCT	13.6/12/ .05	7.8/11/ .05	3.4/ 3/ .05	13.5/12/ .05
NOX SAMPLE METER/RANGE/PPM	33.6/ 2/ 34.	54.7/ 2/ 55.	51.2/ 3/ 154.	35.6/ 2/ 36.
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ 0.	.2/ 2/ 0.	.1/ 3/ 0.	.2/ 2/ 0.
DILUTION FACTOR	34.06	23.48	10.52	35.26
HC CONCENTRATION PPM	30.	49.	55.	40.
CO CONCENTRATION PPM	45.	48.	34.	42.
CO2 CONCENTRATION PCT	.34	.52	1.22	.33
NOX CONCENTRATION PPM	33.4	54.5	153.3	35.4
HC MASS GRAMS	4.86	8.02	9.08	6.36
CO MASS GRAMS	14.37	15.58	11.22	13.65
CO2 MASS GRAMS	1727.6	2653.2	6367.7	1669.5
NOX MASS GRAMS	17.71	29.29	83.80	18.90
FUEL KG (LB)	.555 (1.22)	.849 (1.87)	2.015 (4.44)	.538 (1.19)
KW HR (HP HR)	1.92 (2.58)	3.08 (4.13)	8.81 (11.81)	1.95 (2.62)
BSHC G/KW HR (G/HP HR)	2.53 (1.88)	2.60 (1.94)	1.03 (.77)	3.26 (2.43)
BSCO G/KW HR (G/HP HR)	7.47 (5.57)	5.06 (3.77)	1.27 (.95)	6.99 (5.21)
BSCO2 G/KW HR (G/HP HR)	897.98 (669.62)	861.49 (642.41)	723.05 (539.18)	854.50 (637.20)
BSNOX G/KW HR (G/HP HR)	9.21 (6.87)	9.51 (7.09)	9.52 (7.10)	9.67 (7.21)
BSFC KG/KW HR (LB/HP HR)	.288 (.474)	.276 (.453)	.229 (.376)	.275 (.452)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	15.76 (21.14)
BSHC G/KW HR (G/HP HR)	1.80 (1.34)
BSCO G/KW HR (G/HP HR)	3.48 (2.59)
BSCO2 G/KW HR (G/HP HR)	788. (587.)
BSNOX G/KW HR (G/HP HR)	9.50 (7.08)
BSFC KG/KW HR (LB/HP HR)	.251 (.413)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	9.50
	G/KWHR(G/HPHR)	.60 (.45)
	G/KG FUEL (G/LB FUEL)	2.40 (1.09)
	FILTER EFF.	96.2

TABLE A-9. ENGINE EMISSION RESULTS CONTINUOUS NO_x
C-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D59
ENGINE MODEL 81 CUMMINS NTC-300
ENGINE 0.0 L(0. CID) I-6
CVS NO. 10

TEST NO.D59-5 RUN1
DATE 3/ 5/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 740.66 MM HG(29.16 IN HG)
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)

RELATIVE HUMIDITY , ENGINE-46. PCT , CVS-32. PCT
ABSOLUTE HUMIDITY 8.6 GM/KG(60.5 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER	NYNF	LANF	LAF	NYNF
DESCRIPTION				
BLOWER DIF P MM. H2O(IN. H2O)	642.6 (25.3)	642.6 (25.3)	642.6 (25.3)	642.6 (25.3)
BLOWER INLET P MM. H2O(IN. H2O)	510.5 (20.1)	510.5 (20.1)	510.5 (20.1)	510.5 (20.1)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.7 (116.0)	46.7 (116.0)	46.7 (116.0)	46.7 (116.0)
BLOWER REVOLUTIONS	6183.	6265.	6370.	6226.
TIME SECONDS	296.2	300.1	305.1	298.1
TOTAL FLOW STD. CU. METRES(SCF)	277.5 (9801.)	281.2 (9931.)	285.9 (10097.)	279.4 (9869.)
HC SAMPLE METER/RANGE/PPM	9.7/23/ 49.	11.8/23/ 59.	13.4/23/ 67.	9.2/23/ 46.
HC BCKGRD METER/RANGE/PPM	5.0/ 2/ 5.	4.9/ 2/ 5.	5.2/ 2/ 5.	5.0/ 2/ 5.
CO SAMPLE METER/RANGE/PPM	53.2/13/ 50.	48.3/13/ 45.	41.3/13/ 38.	48.6/13/ 46.
CO BCKGRD METER/RANGE/PPM	.1/13/ 0.	.5/13/ 0.	.3/13/ 0.	.3/13/ 0.
CO2 SAMPLE METER/RANGE/PCT	95.0/12/ .43	68.3/11/ .59	70.2/ 3/ 1.27	87.9/12/ .39
CO2 BCKGRD METER/RANGE/PCT	19.3/12/ .07	10.3/11/ .06	4.0/ 3/ .06	17.2/12/ .06
NOX SAMPLE METER/RANGE/PPM	3.4/14/ 34.	5.2/14/ 52.	17.0/14/ 170.	4.0/14/ 40.
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ 0.	.3/ 2/ 0.	.1/ 3/ 0.	.4/ 2/ 0.
DILUTION FACTOR	30.21	22.26	10.48	33.56
HC CONCENTRATION PPM	44.	54.	62.	41.
CO CONCENTRATION PPM	49.	44.	37.	45.
CO2 CONCENTRATION PCT	.37	.53	1.21	.33
NOX CONCENTRATION PPM	33.5	50.7	166.4	39.2
HC MASS GRAMS	7.01	8.77	10.28	6.65
CO MASS GRAMS	15.97	14.42	12.29	14.54
CO2 MASS GRAMS	1872.7	2736.6	6349.2	1700.8
NOX MASS GRAMS	17.76	27.28	90.99	20.93
FUEL KG (LB)	.603 (1.33)	.876 (1.93)	2.011 (4.43)	.548 (1.21)
KW HR (HP HR)	1.77 (2.37)	2.95 (3.95)	8.81 (11.81)	1.93 (2.59)
BSHC G/KW HR (G/HP HR)	3.96 (2.96)	2.98 (2.22)	1.17 (.87)	3.44 (2.57)
BSCO G/KW HR (G/HP HR)	9.03 (6.74)	4.90 (3.65)	1.40 (1.04)	7.53 (5.61)
BSCO2 G/KW HR (G/HP HR)	1059.64 (790.18)	929.06 (692.80)	720.94 (537.61)	880.60 (656.66)
BSNOX G/KW HR (G/HP HR)	10.05 (7.49)	9.26 (6.91)	10.33 (7.70)	10.84 (8.08)
BSFC KG/KW HR (LB/HP HR)	.341 (.561)	.297 (.489)	.228 (.375)	.284 (.467)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES

GRAMS/TEST	11.43
G/KWHR(G/HPHR)	.74 (.55)
G/KG FUEL (G/LB FUEL)	2.83 (1.28)
FILTER EFF.	96.2

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	15.45 (20.72)
BSHC G/KW HR (G/HP HR)	2.12 (1.58)
BSCO G/KW HR (G/HP HR)	3.70 (2.76)
BSCO2 G/KW HR (G/HP HR)	819. (611.)
BSNOX G/KW HR (G/HP HR)	10.16 (7.58)(Continuous)
BSFC KG/KW HR (LB/HP HR)	.261 (.430)

TABLE A-9. ENGINE EMISSION RESULTS CONTINUOUS NO_x (Cont'd) PROJECT NO. 03-7338-016
H-TRANS.

ENGINE NO.D59
ENGINE MODEL 81 CUMMINS NTC-300
ENGINE 0.0 L(0. CID) I-6
CVS NO. 10

TEST NO.D59-5 RUN1
DATE 3/ 5/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 740.66 MM HG(29.16 IN HG)
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)

RELATIVE HUMIDITY , ENGINE-44. PCT , CVS-62. PCT
ABSOLUTE HUMIDITY 8.6 GM/KG(60.5 GRAINS/LB) NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER				
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	650.2 (25.6)	650.2 (25.6)	650.2 (25.6)	650.2 (25.6)
BLOWER INLET P MM. H2O(IN. H2O)	513.1 (20.2)	513.1 (20.2)	513.1 (20.2)	513.1 (20.2)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.7 (116.0)	46.7 (116.0)	46.7 (116.0)	46.7 (116.0)
BLOWER REVOLUTIONS	6180.	6264.	6370.	6222.
TIME SECONDS	296.1	300.2	305.1	298.1
TOTAL FLOW STD. CU. METRES(SCF)	277.2 (9790.)	280.9 (9923.)	285.7 (10091.)	279.1 (9856.)
HC SAMPLE METER/RANGE/PPM	7.1/23/ 35.	10.9/23/ 54.	11.9/23/ 59.	8.6/23/ 43.
HC BCKGRD METER/RANGE/PPM	5.0/ 2/ 5.	5.2/ 2/ 5.	4.8/ 2/ 5.	3.8/ 2/ 4.
CO SAMPLE METER/RANGE/PPM	48.7/13/ 46.	52.0/13/ 49.	38.2/13/ 35.	46.2/13/ 43.
CO BCKGRD METER/RANGE/PPM	.1/13/ 0.	.1/13/ 0.	.2/13/ 0.	.2/13/ 0.
CO2 SAMPLE METER/RANGE/PCT	87.1/12/ .39	65.7/11/ .56	70.0/ 3/ 1.26	84.7/12/ .37
CO2 BCKGRD METER/RANGE/PCT	13.6/12/ .05	7.8/11/ .05	3.4/ 3/ .05	13.5/12/ .05
NOX SAMPLE METER/RANGE/PPM	3.8/14/ 38.	6.2/14/ 62.	18.8/14/ 188.	4.2/14/ 42.
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ 0.	.2/ 2/ 0.	.1/ 3/ 0.	.2/ 2/ 0.
DILUTION FACTOR	34.06	23.48	10.52	35.26
HC CONCENTRATION PPM	30.	49.	55.	40.
CO CONCENTRATION PPM	45.	48.	34.	42.
CO2 CONCENTRATION PCT	.34	.52	1.22	.33
NOX CONCENTRATION PPM	36.9	60.1	182.1	40.4
HC MASS GRAMS	4.86	8.02	9.08	6.36
CO MASS GRAMS	14.37	15.58	11.22	13.65
CO2 MASS GRAMS	1727.6	2653.2	6367.7	1669.5
NOX MASS GRAMS	19.54	32.32	99.52	21.56
FUEL KG (LB)	.555 (1.22)	.849 (1.87)	2.015 (4.44)	.538 (1.19)
KW HR (HP HR)	1.92 (2.58)	3.08 (4.13)	8.81 (11.81)	1.95 (2.62)
BSHC G/KW HR (G/HP HR)	2.53 (1.88)	2.60 (1.94)	1.03 (.77)	3.26 (2.43)
BSCO G/KW HR (G/HP HR)	7.47 (5.57)	5.06 (3.77)	1.27 (.95)	6.99 (5.21)
BSCO2 G/KW HR (G/HP HR)	897.98 (669.62)	861.49 (642.41)	723.05 (539.18)	854.50 (637.20)
BSNOX G/KW HR (G/HP HR)	10.16 (7.57)	10.49 (7.83)	11.30 (8.43)	11.03 (8.23)
BSFC KG/KW HR (LB/HP HR)	.288 (.474)	.276 (.453)	.229 (.376)	.275 (.452)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	15.76 (21.14)
BSHC G/KW HR (G/HP HR)	1.80 (1.34)
BSCO G/KW HR (G/HP HR)	3.48 (2.59)
BSCO2 G/KW HR (G/HP HR)	788. (587.)
BSNOX G/KW HR (G/HP HR)	10.97 (8.18)
BSFC KG/KW HR (LB/HP HR)	.251 (.413)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	9.50
	G/KWHR(G/HPHR)	.60 (.45)
	G/KG FUEL (G/LB FUEL)	2.40 (1.09)
	FILTER EFF.	96.2

(Continuous)

TABLE A-10. TRANSIENT ENGINE MAP DATA

Engine Model Cummins NTC-300

Date: 2/23/84 Operator: E. Krueger Engr.: [illegible] Engine Hours: —

Barometric Pressure 29.25 in. Hg

Transient Map Results

Speed, rpm	Torque, ft-lb[a]	Speed, rpm	Torque, ft-lb[a]
100	630	2300	261
200	630	2400	0
300	630	2500	—
400	630	2600	—
500	630	2700	—
600	630	2800	—
700	691	2900	—
800	801	3000	—
900	840	3100	—
1000	859	3200	—
1100	858	3300	—
1200	913	3400	—
1300	964	3500	—
1400	968	3600	—
1500	950	3700	—
1600	938	3800	—
1700	914	3900	—
1800	891	4000	—
1900	868	4100	—
2000	832	4200	—
2100	786	4300	—
2200	602	4400	—

Idle Speed 650 rpm

Max. Power 317 hp (837 ft-lb) @ 2000 rpm

Max. Torque 968 ft-lb @ 1400 rpm

Transient Cycle Work by Command, hp-hr

Segment 1	Segment 2	Segment 3	Segment 4	Total
2.62	4.30	12.12	2.62	21.66

APPENDIX B

1980 Detroit Diesel 8V-92TA

Test Results

Table	
B-1	Smoke Test Trace Evaluation
B-2 and B-3	Thirteen-Mode Computer Printouts
B-4 through B-9	Transient Computer Printouts
B-10	Engine Map Data

D60 TABLE B-1. FEDERAL SMOKE TEST TRACE EVALUATION

Engine Model: Detroit Diesel Test No. 1 Date: 3/15/84

Engine S/N: 8VF066052 Run No. 1 Eval. By: Kathy Jacks

Accelerations

First Sequence Interval No.	First Sequence Smoke %	Second Sequence Interval No.	Second Sequence Smoke %	Third Sequence Interval No.	Third Sequence Smoke %
1	5.5	1	6.0	1	10.0
2	13.6	2	13.2	2	13.5
3	15.5	3	15.0	3	15.0
4	18.0	4	16.0	4	16.5
5	19.0	5	18.0	5	17.5
6	18.5	6	18.0	6	19.0
7	17.0	7	14.5	7	16.0
8	14.8	8	12.3	8	12.8
9	11.5	9	9.0	9	10.0
10	7.3	10	6.3	10	8.0
11	15.0	11	16.0	11	6.0
12	25.0	12	21.0	12	15.0
13	12.0	13	8.2	13	25.0
14	7.0	14	5.0	14	10.5
15	4.8	15	4.2	15	6.0
Total Smoke %	204.5		182.7		200.8

Factor (a) = $\frac{588.0}{45}$ = 13.1 %

Lugging

First Sequence Interval No.	First Sequence Smoke %	Second Sequence Interval No.	Second Sequence Smoke %	Third Sequence Interval No.	Third Sequence Smoke %
1	1.6	1	2.3	1	2.4
2	1.6	2	2.1	2	2.4
3	1.7	3	2.1	3	2.6
4	1.7	4	2.0	4	2.4
5	1.6	5	2.3	5	2.4
Total Smoke %	8.2		10.8		12.2

Factor (b) = $\frac{31.2}{15}$ = 2.1 %

Peak

First Sequence Interval No.	First Sequence Smoke %	Second Sequence Interval No.	Second Sequence Smoke %	Third Sequence Interval No.	Third Sequence Smoke %
1	25.0	1	21.0	1	25.0
2	19.0	2	18.0	2	19.0
3	18.5	3	18.0	3	17.5
Total Smoke %	62.5		57.0		61.5

Factor (c) = $\frac{181.0}{9}$ = 20.1 %

TABLE B-2.

13-MODE FEDERAL DIESEL EMISSION CYCLE 1979

ENGINE: DETROIT DIESEL
TEST-1 FUEL: EM-528-F PROJECT: 03-7338-016 DATE: 3/16/84

MODE	POWER PCT	ENGINE SPEED COND / RPM	TORQUE OBS LB-FT	POWER OBS BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	INTAKE HUMID GR/LB	NOX CORR FACT	MEASURED HC PPM	MEASURED CO PPM	MEASURED CO2 PCT	MEASURED NOX PPM	CALCULATED GRAMS / HOUR HC	CALCULATED GRAMS / HOUR CO	CALCULATED GRAMS / HOUR NOX	MODE
1		IDLE / 610.	0.	.0	.077	15.49	91.	1.070	158.	80.	1.23	185.	27.	27.	109.	1
2	2	INTER / 1400.	25.	6.7	.282	39.03	91.	1.088	156.	66.	1.59	170.	76.	64.	291.	2
3	25	INTER / 1400.	305.	81.3	.648	41.97	85.	1.056	136.	40.	3.31	310.	75.	43.	573.	3
4	50	INTER / 1400.	610.	162.6	1.060	46.31	85.	1.043	136.	66.	4.94	600.	83.	78.	1203.	4
5	75	INTER / 1400.	915.	243.9	1.527	53.19	82.	1.027	118.	319.	6.24	920.	83.	427.	2065.	5
6	100	INTER / 1400.	1226.	326.8	2.050	61.27	82.	1.023	88.	1611.	7.26	1035.	71.	2450.	2627.	6
7		IDLE / 602.	0.	.0	.082	15.44	80.	1.038	144.	66.	1.27	195.	25.	23.	115.	7
8	100	RATED / 1950.	940.	349.0	2.215	79.07	83.	1.031	92.	106.	6.16	800.	95.	209.	2658.	8
9	75	RATED / 1950.	705.	261.8	1.762	72.54	83.	1.034	98.	66.	5.31	580.	93.	120.	1784.	9
10	50	RATED / 1950.	470.	174.5	1.330	66.70	94.	1.073	112.	53.	4.32	395.	98.	90.	1169.	10
11	25	RATED / 1950.	235.	87.3	.883	60.39	91.	1.068	124.	66.	3.14	225.	97.	102.	604.	11
12	2	RATED / 1950.	19.	7.1	.505	55.72	91.	1.075	144.	80.	1.92	110.	104.	115.	276.	12
13		IDLE / 604.	0.	.0	.083	15.07	84.	1.046	160.	80.	1.19	180.	30.	30.	116.	13

MODE	CALCULATED GRAMS/LB-FUEL HC	CO	NOX	CALCULATED GRAMS/BHP-HR HC	CO	NOX	F/A DRY MEAS	F/A STOICH	"PHI"	WET HC CORR FACT	F/A CALC	F/A PCT MEAS	POWER CORR FACT	BSFC CORR LB/HP-HR	MODAL WEIGHT FACTOR	MODE
1	5.81	5.86	23.65	**********		******	.0050	.0690	.073	.984	.0060	18.8	.998	*****	.067	1
2	4.47	3.76	17.19	11.34	9.54	43.60	.0073	.0690	.106	.981	.0076	4.6	1.008	2.516	.080	2
3	1.92	1.10	14.74	.92	.53	7.05	.0156	.0690	.227	.967	.0157	.1	1.010	.474	.080	3
4	1.30	1.22	18.91	.51	.48	7.40	.0232	.0690	.336	.954	.0232	-.0	1.015	.385	.080	4
5	.90	4.66	22.54	.34	1.75	8.47	.0290	.0690	.421	.943	.0292	.5	1.021	.368	.080	5
6	.58	19.92	21.36	.22	7.50	8.04	.0339	.0690	.491	.934	.0344	1.5	1.030	.365	.080	6
7	5.14	4.70	23.49	**********		******	.0053	.0690	.078	.984	.0061	14.6	.995	*****	.067	7
8	.72	1.58	20.00	.27	.60	7.62	.0283	.0690	.411	.944	.0287	1.3	1.052	.362	.080	8
9	.88	1.14	16.88	.35	.46	6.81	.0246	.0690	.356	.951	.0248	1.0	1.044	.387	.080	9
10	1.22	1.12	14.65	.56	.51	6.70	.0202	.0690	.293	.958	.0203	.5	1.038	.441	.080	10
11	1.84	1.92	11.40	1.12	1.17	6.92	.0148	.0690	.215	.968	.0149	.4	1.031	.589	.080	11
12	3.44	3.78	9.12	14.75	16.25	39.19	.0092	.0690	.133	.979	.0092	.2	1.026	4.187	.080	12
13	6.07	6.05	23.25	**********		******	.0056	.0690	.081	.985	.0058	3.0	.997	*****	.067	13

CYCLE COMPOSITE USING 13-MODE WEIGHT FACTORS

BSHC ------- =	.554	GRAM/BHP-HR
BSCO ------- =	2.213	GRAM/BHP-HR
BSNOX ------ =	7.957	GRAM/BHP-HR
BSHC + BSNOX =	8.511	GRAM/BHP-HR
CORR. BSFC - =	.425	LBS/BHP-HR

TABLE B-3.

13-MODE FEDERAL DIESEL EMISSION CYCLE 1979

ENGINE: DETROIT DIESEL 8V92-TA BAROMETER: 29.10
TEST-2 FUEL: EM-528-F PROJECT: 03-7338-016 DATE: 3/19/84

MODE	POWER PCT	ENGINE SPEED COND / RPM	TORQUE OBS LB-FT	POWER OBS BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	INTAKE HUMID GR/LB	NOX CORR FACT	MEASURED HC PPM	MEASURED CO PPM	MEASURED CO2 PCT	MEASURED NOX PPM	CALCULATED GRAMS / HOUR HC	CALCULATED GRAMS / HOUR CO	CALCULATED GRAMS / HOUR NOX	MODE
1		IDLE / 600.	0.	.0	.085	15.11	23.	.865	140.	66.	1.27	220.	25.	24.	113.	1
2	2	INTER / 1400.	25.	6.7	.267	39.01	23.	.877	156.	80.	1.54	135.	73.	75.	181.	2
3	25	INTER / 1400.	308.	82.1	.633	42.56	23.	.884	122.	53.	3.25	350.	66.	57.	539.	3
4	50	INTER / 1400.	615.	163.9	1.077	47.40	23.	.892	122.	53.	4.94	695.	75.	63.	1211.	4
5	75	INTER / 1400.	922.	245.8	1.540	53.69	23.	.898	110.	279.	6.08	960.	80.	387.	1951.	5
6	100	INTER / 1400.	1230.	327.9	2.058	61.71	23.	.903	92.	1345.	7.08	1140.	76.	2112.	2637.	6
7		IDLE / 600.	0.	.0	.075	15.29	23.	.864	140.	66.	1.19	205.	24.	23.	99.	7
8	100	RATED / 1950.	956.	355.0	2.233	79.79	23.	.897	92.	93.	5.76	920.	102.	198.	2869.	8
9	75	RATED / 1950.	717.	266.2	1.787	73.34	23.	.894	94.	80.	5.01	675.	95.	157.	1928.	9
10	50	RATED / 1950.	478.	177.5	1.353	67.57	23.	.889	110.	53.	4.12	455.	102.	96.	1191.	10
11	25	RATED / 1950.	239.	88.7	.875	61.41	23.	.881	126.	66.	2.91	250.	105.	109.	592.	11
12	2	RATED / 1950.	19.	7.1	.512	58.25	23.	.875	154.	66.	1.82	125.	118.	101.	273.	12
13		IDLE / 600.	0.	.0	.082	15.18	23.	.865	140.	53.	1.15	200.	27.	20.	109.	13

MODE	CALCULATED GRAMS/LB-FUEL HC	CO	NOX	CALCULATED GRAMS/BHP-HR HC	CO	NOX	F/A DRY MEAS	F/A STOICH	"PHI"	WET HC CORR FACT	F/A CALC	F/A PCT MEAS	POWER CORR FACT	BSFC CORR LB/HP-HR	MODAL WEIGHT FACTOR	MODE
1	4.98	4.70	22.10	**********		******	.0056	.0690	.082	.987	.0061	8.5	.995	*****	.067	1
2	4.59	4.70	11.34	11.03	11.28	27.23	.0069	.0690	.099	.985	.0074	8.1	1.005	2.388	.080	2
3	1.74	1.49	14.20	.81	.69	6.57	.0149	.0690	.216	.970	.0154	3.0	1.008	.459	.080	3
4	1.17	.98	18.74	.46	.39	7.39	.0228	.0690	.330	.956	.0232	1.6	1.012	.389	.080	4
5	.86	4.19	21.11	.32	1.57	7.94	.0288	.0690	.417	.947	.0284	-1.2	1.019	.369	.080	5
6	.62	17.10	21.35	.23	6.44	8.04	.0335	.0690	.485	.938	.0334	-.1	1.027	.367	.080	6
7	5.31	5.01	21.93	**********		******	.0049	.0690	.071	.988	.0057	16.8	.995	*****	.067	7
8	.76	1.48	21.41	.29	.56	8.08	.0281	.0690	.407	.950	.0269	-4.3	1.049	.360	.080	8
9	.89	1.46	17.98	.36	.59	7.24	.0244	.0690	.354	.956	.0235	-4.0	1.041	.387	.080	9
10	1.25	1.18	14.66	.57	.54	6.71	.0201	.0690	.291	.963	.0194	-3.5	1.034	.443	.080	10
11	2.00	2.07	11.27	1.19	1.22	6.67	.0143	.0690	.207	.973	.0138	-3.5	1.028	.575	.080	11
12	3.86	3.29	8.90	16.79	14.32	38.74	.0088	.0690	.128	.983	.0087	-1.0	1.023	4.254	.080	12
13	5.49	4.16	22.17	**********		******	.0054	.0690	.078	.989	.0056	2.9	.996	*****	.067	13

CYCLE COMPOSITE USING 13-MODE WEIGHT FACTORS

BSHC ------- =	.556	GRAM/BHP-HR
BSCO ------- =	1.982	GRAM/BHP-HR
BSNOX ------ =	7.927	GRAM/BHP-HR
BSHC + BSNOX =	8.483	GRAM/BHP-HR
CORR. BSFC - =	.424	LBS/BHP-HR

TABLE B-4. ENGINE EMISSION RESULTS
C-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D60
ENGINE MODEL 0 D.D. 8V92TA
ENGINE 0.0 L(0. CID)
CVS NO. 10

TEST NO.D60-1 RUN1
DATE 3/19/84
TIME 9:38
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 740.92 MM HG(29.17 IN HG)
DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)

RELATIVE HUMIDITY , ENGINE-57. PCT , CVS-48. PCT
ABSOLUTE HUMIDITY 9.2 GM/KG(64.1 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER	1	2	3	4
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	640.1 (25.2)	640.1 (25.2)	640.1 (25.2)	640.1 (25.2)
BLOWER INLET P MM. H2O(IN. H2O)	495.3 (19.5)	495.3 (19.5)	495.3 (19.5)	495.3 (19.5)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.2 (108.0)	42.2 (108.0)	42.2 (108.0)	42.2 (108.0)
BLOWER REVOLUTIONS	6179.	6263.	6369.	6217.
TIME SECONDS	296.0	300.0	305.0	298.0
TOTAL FLOW STD. CU. METRES(SCF)	279.4 (9867.)	283.2 (10001.)	288.0 (10170.)	281.1 (9927.)
HC SAMPLE METER/RANGE/PPM	23.0/22/ 23.	21.9/22/ 22.	37.6/22/ 38.	23.6/22/ 24.
HC BCKGRD METER/RANGE/PPM	5.7/ 2/ 6.	5.5/ 2/ 6.	6.6/ 2/ 7.	7.0/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	31.9/13/ 29.	26.2/13/ 24.	39.6/13/ 37.	72.4/13/ 71.
CO BCKGRD METER/RANGE/PPM	.4/13/ 0.	1.1/13/ 1.	1.6/13/ 1.	1.3/13/ 1.
CO2 SAMPLE METER/RANGE/PCT	61.1/11/ .51	74.9/11/ .67	89.2/ 3/ 1.66	60.5/11/ .50
CO2 BCKGRD METER/RANGE/PCT	9.0/11/ .05	9.2/11/ .06	3.9/ 3/ .06	9.2/11/ .06
NOX SAMPLE METER/RANGE/PPM	38.2/ 2/ 38.	56.9/ 2/ 57.	61.2/ 3/ 184.	50.6/ 2/ 51.
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ 0.	.4/ 2/ 0.	.4/ 3/ 1.	.1/ 2/ 0.
DILUTION FACTOR	26.13	19.74	8.03	26.26
HC CONCENTRATION PPM	18.	17.	32.	17.
CO CONCENTRATION PPM	28.	22.	34.	68.
CO2 CONCENTRATION PCT	.46	.62	1.61	.45
NOX CONCENTRATION PPM	38.1	56.5	182.5	50.5
HC MASS GRAMS	2.82	2.72	5.28	2.74
CO MASS GRAMS	9.21	7.38	11.35	22.21
CO2 MASS GRAMS	2329.2	3221.3	8485.3	2302.5
NOX MASS GRAMS	20.36	30.61	100.55	27.15
FUEL KG (LB)	.739 (1.63)	1.018 (2.25)	2.677 (5.90)	.737 (1.62)
KW HR (HP HR)	1.89 (2.54)	3.30 (4.42)	11.25 (15.09)	2.39 (3.20)
BSHC G/KW HR (G/HP HR)	1.49 (1.11)	.83 (.62)	.47 (.35)	1.15 (.86)
BSCO G/KW HR (G/HP HR)	4.86 (3.62)	2.24 (1.67)	1.01 (.75)	9.31 (6.94)
BSCO2 G/KW HR (G/HP HR)	1229.73 (917.01)	977.34 (728.80)	754.07 (562.31)	964.89 (719.52)
BSNOX G/KW HR (G/HP HR)	10.75 (8.02)	9.29 (6.93)	8.94 (6.66)	11.38 (8.49)
BSFC KG/KW HR (LB/HP HR)	.390 (.641)	.309 (.508)	.238 (.391)	.309 (.508)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	10.22
	G/KWHR(G/HPHR)	.54 (.40)
	G/KG FUEL (G/LB FUEL)	1.98 (.90)
	FILTER EFF.	94.9

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	18.83 (25.25)
BSHC G/KW HR (G/HP HR)	.72 (.54)
BSCO G/KW HR (G/HP HR)	2.66 (1.99)
BSCO2 G/KW HR (G/HP HR)	868. (647.)
BSNOX G/KW HR (G/HP HR)	9.49 (7.08)
BSFC KG/KW HR (LB/HP HR)	.275 (.451)

TABLE B-4. ENGINE EMISSION RESULTS (cont'd)
H-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D60
ENGINE MODEL 0 D.D. 8V92TA
ENGINE 0.0 L(0. CID)
CVS NO. 10

TEST NO.D60-1 RUN1
DATE 3/19/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 741.17 MM HG(29.18 IN HG)
DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)

RELATIVE HUMIDITY , ENGINE-57. PCT , CVS-48. PCT
ABSOLUTE HUMIDITY 9.8 GM/KG(68.6 GRAINS/LB) NOX HUMIDITY C.F. 1.0000

BAG RESULTS

	1	2	3	4
BAG NUMBER				
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	627.4 (24.7)	627.4 (24.7)	627.4 (24.7)	627.4 (24.7)
BLOWER INLET P MM. H2O(IN. H2O)	485.1 (19.1)	485.1 (19.1)	485.1 (19.1)	485.1 (19.1)
BLOWER INLET TEMP. DEG. C(DEG. F)	41.7 (107.0)	41.7 (107.0)	41.7 (107.0)	41.7 (107.0)
BLOWER REVOLUTIONS	6179.	6263.	6370.	6219.
TIME SECONDS	296.0	300.0	305.0	298.0
TOTAL FLOW STD. CU. METRES(SCF)	280.1 (9892.)	283.9 (10027.)	288.7 (10198.)	281.9 (9956.)
HC SAMPLE METER/RANGE/PPM	20.4/22/ 20.	24.4/22/ 24.	37.8/22/ 38.	23.4/22/ 23.
HC BCKGRD METER/RANGE/PPM	7.2/ 2/ 7.	7.0/ 2/ 7.	6.0/ 2/ 6.	5.1/ 2/ 5.
CO SAMPLE METER/RANGE/PPM	81.5/13/ 81.	38.6/13/ 36.	40.4/13/ 38.	70.9/13/ 69.
CO BCKGRD METER/RANGE/PPM	1.6/13/ 1.	1.4/13/ 1.	1.5/13/ 1.	1.1/13/ 1.
CO2 SAMPLE METER/RANGE/PCT	58.8/11/ .48	75.9/11/ .69	88.6/ 3/ 1.65	59.6/11/ .49
CO2 BCKGRD METER/RANGE/PCT	8.8/11/ .05	8.8/11/ .05	3.4/ 3/ .05	8.5/11/ .05
NOX SAMPLE METER/RANGE/PPM	48.6/ 2/ 49.	71.7/ 2/ 72.	65.4/ 3/ 196.	51.2/ 2/ 51.
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ 0.	.3/ 2/ 0.	.3/ 3/ 1.	.2/ 2/ 0.
DILUTION FACTOR	27.23	19.33	8.09	26.79
HC CONCENTRATION PPM	13.	18.	33.	18.
CO CONCENTRATION PPM	77.	34.	35.	66.
CO2 CONCENTRATION PCT	.43	.64	1.60	.44
NOX CONCENTRATION PPM	48.3	71.4	195.4	51.0
HC MASS GRAMS	2.18	2.91	5.42	3.00
CO MASS GRAMS	25.27	11.12	11.66	21.81
CO2 MASS GRAMS	2210.2	3310.3	8477.6	2279.6
NOX MASS GRAMS	25.88	38.78	107.93	27.50
FUEL KG (LB)	.709 (1.56)	1.048 (2.31)	2.674 (5.90)	.730 (1.61)
KW HR (HP HR)	2.30 (3.08)	3.65 (4.90)	11.31 (15.17)	2.38 (3.19)
BSHC G/KW HR (G/HP HR)	.95 (.71)	.80 (.59)	.48 (.36)	1.26 (.94)
BSCO G/KW HR (G/HP HR)	11.00 (8.20)	3.04 (2.27)	1.03 (.77)	9.17 (6.84)
BSCO2 G/KW HR (G/HP HR)	962.31 (717.59)	905.96 (675.58)	749.42 (558.84)	958.32 (714.62)
BSNOX G/KW HR (G/HP HR)	11.27 (8.40)	10.61 (7.91)	9.54 (7.11)	11.56 (8.62)
BSFC KG/KW HR (LB/HP HR)	.309 (.507)	.287 (.472)	.236 (.389)	.307 (.504)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	19.64 (26.34)
BSHC G/KW HR (G/HP HR)	.69 (.51)
BSCO G/KW HR (G/HP HR)	3.56 (2.65)
BSCO2 G/KW HR (G/HP HR)	829. (618.)
BSNOX G/KW HR (G/HP HR)	10.19 (7.60)
BSFC KG/KW HR (LB/HP HR)	.263 (.432)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	12.21
	G/KWHR(G/HPHR)	.62 (.46)
	G/KG FUEL (G/LB FUEL)	2.36 (1.07)
	FILTER EFF.	96.6

TABLE B-5. ENGINE EMISSION RESULTS CONTINUOUS NO_x
C-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D60
ENGINE MODEL 0 D.D. 8V92TA
ENGINE 0.0 L(0. CID)
CVS NO. 10

TEST NO.D60-1 RUN1
DATE 3/19/84
TIME 9:38
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 740.92 MM HG(29.17 IN HG)
DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)

RELATIVE HUMIDITY , ENGINE-57. PCT , CVS-48. PCT
ABSOLUTE HUMIDITY 9.2 GM/KG(64.1 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1 NYNF	2 LANF	3 LAF	4 NYNF
BAG NUMBER				
DESCRIPTION				
BLOWER DIF P MM. H2O(IN. H2O)	640.1 (25.2)	640.1 (25.2)	640.1 (25.2)	640.1 (25.2)
BLOWER INLET P MM. H2O(IN. H2O)	495.3 (19.5)	495.3 (19.5)	495.3 (19.5)	495.3 (19.5)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.2 (108.0)	42.2 (108.0)	42.2 (108.0)	42.2 (108.0)
BLOWER REVOLUTIONS	6179.	6263.	6369.	6217.
TIME SECONDS	296.0	300.0	305.0	298.0
TOTAL FLOW STD. CU. METRES(SCF)	279.4 (9867.)	283.2 (10001.)	288.0 (10170.)	281.1 (9927.)
HC SAMPLE METER/RANGE/PPM	23.0/22/ 23.	21.9/22/ 22.	37.6/22/ 38.	23.6/22/ 24.
HC BCKGRD METER/RANGE/PPM	5.7/ 2/ 6.	5.5/ 2/ 6.	6.6/ 2/ 7.	7.0/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	31.9/13/ 29.	26.2/13/ 24.	39.6/13/ 37.	72.4/13/ 71.
CO BCKGRD METER/RANGE/PPM	.4/13/ 0.	1.1/13/ 1.	1.6/13/ 1.	1.3/13/ 1.
CO2 SAMPLE METER/RANGE/PCT	61.1/11/ .51	74.9/11/ .67	89.2/ 3/ 1.66	60.5/11/ .50
CO2 BCKGRD METER/RANGE/PCT	9.0/11/ .05	9.2/11/ .06	3.9/ 3/ .06	9.2/11/ .06
NOX SAMPLE METER/RANGE/PPM	13.8/13/ 41.	19.4/13/ 58.	61.4/13/ 184.	17.5/13/ 53.
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ 0.	.4/ 2/ 0.	.4/ 3/ 1.	.1/ 2/ 0.
DILUTION FACTOR	26.13	19.74	8.03	26.26
HC CONCENTRATION PPM	18.	17.	32.	17.
CO CONCENTRATION PPM	28.	22.	34.	68.
CO2 CONCENTRATION PCT	.46	.62	1.61	.45
NOX CONCENTRATION PPM	40.5	56.7	177.5	51.5
HC MASS GRAMS	2.82	2.72	5.28	2.74
CO MASS GRAMS	9.21	7.38	11.35	22.21
CO2 MASS GRAMS	2329.2	3221.3	8485.3	2302.5
NOX MASS GRAMS	21.65	30.70	97.79	27.67
FUEL KG (LB)	.739 (1.63)	1.018 (2.25)	2.677 (5.90)	.737 (1.62)
KW HR (HP HR)	1.89 (2.54)	3.30 (4.42)	11.25 (15.09)	2.39 (3.20)
BSHC G/KW HR (G/HP HR)	1.49 (1.11)	.83 (.62)	.47 (.35)	1.15 (.86)
BSCO G/KW HR (G/HP HR)	4.86 (3.62)	2.24 (1.67)	1.01 (.75)	9.31 (6.94)
BSCO2 G/KW HR (G/HP HR)	1229.73 (917.01)	977.34 (728.80)	754.07 (562.31)	964.89 (719.52)
BSNOX G/KW HR (G/HP HR)	11.43 (8.52)	9.31 (6.95)	8.69 (6.48)	11.60 (8.65)
BSFC KG/KW HR (LB/HP HR)	.390 (.641)	.309 (.508)	.238 (.391)	.309 (.508)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	10.22
	G/KWHR(G/HPHR)	.54 (.40)
	G/KG FUEL (G/LB FUEL)	1.98 (.90)
	FILTER EFF.	94.9

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	18.83 (25.25)
BSHC G/KW HR (G/HP HR)	.72 (.54)
BSCO G/KW HR (G/HP HR)	2.66 (1.99)
BSCO2 G/KW HR (G/HP HR)	868. (647.)
BSNOX G/KW HR (G/HP HR)	9.44 (7.04)
BSFC KG/KW HR (LB/HP HR)	.275 (.451)

(continuous)

TABLE B-5. ENGINE EMISSION RESULTS CONTINUOUS NO_x (cont'd)
H-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D60
ENGINE MODEL 0 D.D. 8V92TA
ENGINE 0.0 L(0. CID)
CVS NO. 10

TEST NO.D60-1 RUN1
DATE 3/19/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 741.17 MM HG(29.18 IN HG)
DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)

RELATIVE HUMIDITY , ENGINE-57. PCT , CVS-48. PCT
ABSOLUTE HUMIDITY 9.8 GM/KG(68.6 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER	NYNF	LANF	LAF	NYNF
DESCRIPTION				
BLOWER DIF P MM. H2O(IN. H2O)	627.4 (24.7)	627.4 (24.7)	627.4 (24.7)	627.4 (24.7)
BLOWER INLET P MM. H2O(IN. H2O)	485.1 (19.1)	485.1 (19.1)	485.1 (19.1)	485.1 (19.1)
BLOWER INLET TEMP. DEG. C(DEG. F)	41.7 (107.0)	41.7 (107.0)	41.7 (107.0)	41.7 (107.0)
BLOWER REVOLUTIONS	6179.	6263.	6370.	6219.
TIME SECONDS	296.0	300.0	305.0	298.0
TOTAL FLOW STD. CU. METRES(SCF)	280.1 (9892.)	283.9 (10027.)	288.7 (10198.)	281.9 (9956.)
HC SAMPLE METER/RANGE/PPM	20.4/22/ 20.	24.4/22/ 24.	37.8/22/ 38.	23.4/22/ 23.
HC BCKGRD METER/RANGE/PPM	7.2/ 2/ 7.	7.0/ 2/ 7.	6.0/ 2/ 6.	5.1/ 2/ 5.
CO SAMPLE METER/RANGE/PPM	81.5/13/ 81.	38.6/13/ 36.	40.4/13/ 38.	70.9/13/ 69.
CO BCKGRD METER/RANGE/PPM	1.6/13/ 1.	1.4/13/ 1.	1.5/13/ 1.	1.1/13/ 1.
CO2 SAMPLE METER/RANGE/PCT	58.8/11/ .48	75.9/11/ .69	88.6/ 3/ 1.65	59.6/11/ .49
CO2 BCKGRD METER/RANGE/PCT	8.8/11/ .05	8.8/11/ .05	3.4/ 3/ .05	8.5/11/ .05
NOX SAMPLE METER/RANGE/PPM	5.4/14/ 54.	7.6/14/ 76.	22.5/14/ 225.	5.7/14/ 57.
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ 0.	.3/ 2/ 0.	.3/ 3/ 1.	.2/ 2/ 0.
DILUTION FACTOR	27.23	19.33	8.09	26.79
HC CONCENTRATION PPM	13.	18.	33.	18.
CO CONCENTRATION PPM	77.	34.	35.	66.
CO2 CONCENTRATION PCT	.43	.64	1.60	.44
NOX CONCENTRATION PPM	52.2	73.9	217.5	55.2
HC MASS GRAMS	2.18	2.91	5.42	3.00
CO MASS GRAMS	25.27	11.12	11.66	21.81
CO2 MASS GRAMS	2210.2	3310.3	8477.6	2279.6
NOX MASS GRAMS	27.94	40.13	120.13	29.77
FUEL KG (LB)	.709 (1.56)	1.048 (2.31)	2.674 (5.90)	.730 (1.61)
KW HR (HP HR)	2.30 (3.08)	3.65 (4.90)	11.31 (15.17)	2.38 (3.19)
BSHC G/KW HR (G/HP HR)	.95 (.71)	.80 (.59)	.48 (.36)	1.26 (.94)
BSCO G/KW HR (G/HP HR)	11.00 (8.20)	3.04 (2.27)	1.03 (.77)	9.17 (6.84)
BSCO2 G/KW HR (G/HP HR)	962.31 (717.59)	905.96 (675.58)	749.42 (558.84)	958.32 (714.62)
BSNOX G/KW HR (G/HP HR)	12.17 (9.07)	10.98 (8.19)	10.62 (7.92)	12.52 (9.33)
BSFC KG/KW HR (LB/HP HR)	.309 (.507)	.287 (.472)	.236 (.389)	.307 (.504)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES

GRAMS/TEST	12.21
G/KWHR(G/HPHR)	.62 (.46)
G/KG FUEL (G/LB FUEL)	2.36 (1.07)
FILTER EFF.	96.6

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	19.64 (26.34)
BSHC G/KW HR (G/HP HR)	.69 (.51)
BSCO G/KW HR (G/HP HR)	3.56 (2.65)
BSCO2 G/KW HR (G/HP HR)	829. (618.)
BSNOX G/KW HR (G/HP HR)	11.10 (8.28)
BSFC KG/KW HR (LB/HP HR)	.263 (.432)

(continuous)

TABLE B-6. ENGINE EMISSION RESULTS
C-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D60
ENGINE MODEL 0 D.D. 8V92TA
ENGINE 0.0 L(0. CID)
CVS NO. 10

TEST NO.D60-2 RUN1
DATE 3/20/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 744.73 MM HG(29.32 IN HG)
DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)

RELATIVE HUMIDITY , ENGINE-51. PCT , CVS-32. PCT
ABSOLUTE HUMIDITY 8.4 GM/KG(58.9 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS

	1	2	3	4
BAG NUMBER				
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	645.2 (25.4)	645.2 (25.4)	645.2 (25.4)	645.2 (25.4)
BLOWER INLET P MM. H2O(IN. H2O)	500.4 (19.7)	500.4 (19.7)	500.4 (19.7)	500.4 (19.7)
BLOWER INLET TEMP. DEG. C(DEG. F)	45.6 (114.0)	45.6 (114.0)	45.6 (114.0)	45.6 (114.0)
BLOWER REVOLUTIONS	6183.	6265.	6372.	6219.
TIME SECONDS	296.1	300.1	305.1	297.9
TOTAL FLOW STD. CU. METRES(SCF)	279.8 (9884.)	283.5 (10015.)	288.4 (10186.)	281.5 (9941.)
HC SAMPLE METER/RANGE/PPM	27.3/22/ 27.	25.5/22/ 26.	40.2/22/ 40.	25.9/22/ 26.
HC BCKGRD METER/RANGE/PPM	8.0/ 2/ 8.	7.8/ 2/ 8.	8.3/ 2/ 8.	7.7/ 2/ 8.
CO SAMPLE METER/RANGE/PPM	33.9/13/ 31.	28.2/13/ 26.	42.6/13/ 40.	73.9/13/ 72.
CO BCKGRD METER/RANGE/PPM	1.2/13/ 1.	1.4/13/ 1.	2.6/13/ 2.	2.9/13/ 3.
CO2 SAMPLE METER/RANGE/PCT	62.6/11/ .52	75.8/11/ .69	90.9/ 3/ 1.70	61.8/11/ .52
CO2 BCKGRD METER/RANGE/PCT	10.4/11/ .06	12.3/11/ .08	5.3/ 3/ .08	12.0/11/ .07
NOX SAMPLE METER/RANGE/PPM	38.7/ 2/ 39.	55.3/ 2/ 55.	62.8/ 3/ 188.	51.6/ 2/ 52.
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ 0.	.7/ 2/ 1.	.8/ 3/ 2.	1.5/ 2/ 2.
DILUTION FACTOR	25.26	19.39	7.86	25.51
HC CONCENTRATION PPM	20.	18.	33.	18.
CO CONCENTRATION PPM	30.	24.	36.	68.
CO2 CONCENTRATION PCT	.46	.61	1.63	.44
NOX CONCENTRATION PPM	38.4	54.6	186.3	50.2
HC MASS GRAMS	3.17	2.96	5.48	3.00
CO MASS GRAMS	9.66	7.95	12.10	22.44
CO2 MASS GRAMS	2375.9	3186.7	8586.8	2290.5
NOX MASS GRAMS	20.56	29.63	102.78	27.01
FUEL KG (LB)	.754 (1.66)	1.008 (2.22)	2.709 (5.97)	.734 (1.62)
KW HR (HP HR)	1.91 (2.56)	3.29 (4.41)	11.25 (15.08)	2.36 (3.16)
BSHC G/KW HR (G/HP HR)	1.66 (1.24)	.90 (.67)	.49 (.36)	1.27 (.95)
BSCO G/KW HR (G/HP HR)	5.06 (3.77)	2.42 (1.80)	1.08 (.80)	9.52 (7.10)
BSCO2 G/KW HR (G/HP HR)	1244.58 (928.08)	969.03 (722.61)	763.60 (569.41)	972.01 (724.83)
BSNOX G/KW HR (G/HP HR)	10.77 (8.03)	9.01 (6.72)	9.14 (6.82)	11.46 (8.55)
BSFC KG/KW HR (LB/HP HR)	.395 (.650)	.307 (.504)	.241 (.396)	.311 (.512)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	18.80 (25.21)
BSHC G/KW HR (G/HP HR)	.78 (.58)
BSCO G/KW HR (G/HP HR)	2.77 (2.07)
BSCO2 G/KW HR (G/HP HR)	875. (652.)
BSNOX G/KW HR (G/HP HR)	9.57 (7.14)
BSFC KG/KW HR (LB/HP HR)	.277 (.455)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	9.93
	G/KWHR(G/HPHR)	.53 (.39)
	G/KG FUEL (G/LB FUEL)	1.91 (.87)
	FILTER EFF.	96.1

TABLE B-6. ENGINE EMISSION RESULTS (cont'd)
H-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D60
ENGINE MODEL 0 D.D. 8V92TA
ENGINE 0.0 L(0. CID)
CVS NO. 10

TEST NO.D60-2 RUN1
DATE 3/20/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 744.22 MM HG(29.30 IN HG)
DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)

RELATIVE HUMIDITY , ENGINE-55. PCT , CVS-29. PCT
ABSOLUTE HUMIDITY 9.1 GM/KG(63.7 GRAINS/LB) NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER	NYNF	LANF	LAF	NYNF
DESCRIPTION				
BLOWER DIF P MM. H2O(IN. H2O)	635.0 (25.0)	635.0 (25.0)	635.0 (25.0)	635.0 (25.0)
BLOWER INLET P MM. H2O(IN. H2O)	502.9 (19.8)	502.9 (19.8)	502.9 (19.8)	502.9 (19.8)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)
BLOWER REVOLUTIONS	6182.	6264.	6371.	6221.
TIME SECONDS	296.1	300.0	305.0	297.0
TOTAL FLOW STD. CU. METRES(SCF)	279.4 (9869.)	283.1 (10000.)	288.0 (10171.)	281.2 (9933.)
HC SAMPLE METER/RANGE/PPM	19.6/22/ 20.	24.2/22/ 24.	39.2/22/ 39.	25.2/22/ 25.
HC BCKGRD METER/RANGE/PPM	6.3/ 2/ 6.	7.0/ 2/ 7.	6.8/ 2/ 7.	5.9/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	80.2/13/ 79.	39.2/13/ 36.	43.2/13/ 40.	72.7/13/ 71.
CO BCKGRD METER/RANGE/PPM	2.0/13/ 2.	2.0/13/ 2.	2.1/13/ 2.	1.9/13/ 2.
CO2 SAMPLE METER/RANGE/PCT	59.7/11/ .49	75.9/11/ .69	90.5/ 3/ 1.69	60.1/11/ .50
CO2 BCKGRD METER/RANGE/PCT	8.2/11/ .05	8.8/11/ .05	3.3/ 3/ .05	9.1/11/ .06
NOX SAMPLE METER/RANGE/PPM	49.4/ 2/ 49.	69.6/ 2/ 70.	64.9/ 3/ 195.	51.7/ 2/ 52.
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ 1.	.8/ 2/ 1.	.5/ 3/ 2.	1.2/ 2/ 1.
DILUTION FACTOR	26.70	19.33	7.90	26.48
HC CONCENTRATION PPM	14.	18.	33.	20.
CO CONCENTRATION PPM	76.	34.	37.	68.
CO2 CONCENTRATION PCT	.44	.64	1.64	.44
NOX CONCENTRATION PPM	48.9	68.8	193.4	50.5
HC MASS GRAMS	2.18	2.87	5.53	3.17
CO MASS GRAMS	24.79	11.18	12.42	22.30
CO2 MASS GRAMS	2274.7	3301.4	8672.6	2283.9
NOX MASS GRAMS	26.15	37.28	106.53	27.19
FUEL KG (LB)	.729 (1.61)	1.046 (2.30)	2.736 (6.03)	.732 (1.61)
KW HR (HP HR)	2.35 (3.15)	3.67 (4.92)	11.30 (15.15)	2.42 (3.24)
BSHC G/KW HR (G/HP HR)	.93 (.69)	.78 (.58)	.49 (.37)	1.31 (.98)
BSCO G/KW HR (G/HP HR)	10.55 (7.87)	3.05 (2.27)	1.10 (.82)	9.23 (6.88)
BSCO2 G/KW HR (G/HP HR)	968.39 (722.13)	899.84 (671.01)	767.67 (572.45)	945.30 (704.91)
BSNOX G/KW HR (G/HP HR)	11.13 (8.30)	10.16 (7.58)	9.43 (7.03)	11.25 (8.39)
BSFC KG/KW HR (LB/HP HR)	.310 (.510)	.285 (.468)	.242 (.398)	.303 (.498)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	10.33
	G/KWHR(G/HPHR)	.52 (.39)
	G/KG FUEL (G/LB FUEL)	1.97 (.89)
	FILTER EFF.	96.7

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	19.73 (26.46)
BSHC G/KW HR (G/HP HR)	.70 (.52)
BSCO G/KW HR (G/HP HR)	3.58 (2.67)
BSCO2 G/KW HR (G/HP HR)	838. (625.)
BSNOX G/KW HR (G/HP HR)	9.99 (7.45)
BSFC KG/KW HR (LB/HP HR)	.266 (.437)

TABLE B-7. ENGINE EMISSION RESULTS CONTINUOUS NO_x
C-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D60
ENGINE MODEL 0 D.D. 8V92TA
ENGINE 0.0 L(0. CID)
CVS NO. 10

TEST NO.D60-2 RUN1
DATE 3/20/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 744.73 MM HG(29.32 IN HG)
DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)

RELATIVE HUMIDITY , ENGINE-51. PCT , CVS-32. PCT
ABSOLUTE HUMIDITY 8.4 GM/KG(58.9 GRAINS/LB) NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER				
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	645.2 (25.4)	645.2 (25.4)	645.2 (25.4)	645.2 (25.4)
BLOWER INLET P MM. H2O(IN. H2O)	500.4 (19.7)	500.4 (19.7)	500.4 (19.7)	500.4 (19.7)
BLOWER INLET TEMP. DEG. C(DEG. F)	45.6 (114.0)	45.6 (114.0)	45.6 (114.0)	45.6 (114.0)
BLOWER REVOLUTIONS	6183.	6265.	6372.	6219.
TIME SECONDS	296.1	300.1	305.1	297.9
TOTAL FLOW STD. CU. METRES(SCF)	279.8 (9884.)	283.5 (10015.)	288.4 (10186.)	281.5 (9941.)
HC SAMPLE METER/RANGE/PPM	27.3/22/ 27.	25.5/22/ 26.	40.2/22/ 40.	25.9/22/ 26.
HC BCKGRD METER/RANGE/PPM	8.0/ 2/ 8.	7.8/ 2/ 8.	8.3/ 2/ 8.	7.7/ 2/ 8.
CO SAMPLE METER/RANGE/PPM	33.9/13/ 31.	28.2/13/ 26.	42.6/13/ 40.	73.9/13/ 72.
CO BCKGRD METER/RANGE/PPM	1.2/13/ 1.	1.4/13/ 1.	2.6/13/ 2.	2.9/13/ 3.
CO2 SAMPLE METER/RANGE/PCT	62.6/11/ .52	75.8/11/ .69	90.9/ 3/ 1.70	61.8/11/ .52
CO2 BCKGRD METER/RANGE/PCT	10.4/11/ .06	12.3/11/ .08	5.3/ 3/ .08	12.0/11/ .07
NOX SAMPLE METER/RANGE/PPM	4.3/14/ 43.	6.1/14/ 61.	22.2/14/ 222.	5.8/14/ 58.
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ 0.	.7/ 2/ 1.	.8/ 3/ 2.	1.5/ 2/ 2.
DILUTION FACTOR	25.26	19.39	7.86	25.51
HC CONCENTRATION PPM	20.	18.	33.	18.
CO CONCENTRATION PPM	30.	24.	36.	68.
CO2 CONCENTRATION PCT	.46	.61	1.63	.44
NOX CONCENTRATION PPM	41.9	59.3	214.0	55.7
HC MASS GRAMS	3.17	2.96	5.48	3.00
CO MASS GRAMS	9.66	7.95	12.10	22.44
CO2 MASS GRAMS	2375.9	3186.7	8586.8	2290.5
NOX MASS GRAMS	22.41	32.14	118.04	29.98
FUEL KG (LB)	.754 (1.66)	1.008 (2.22)	2.709 (5.97)	.734 (1.62)
KW HR (HP HR)	1.91 (2.56)	3.29 (4.41)	11.25 (15.08)	2.36 (3.16)
BSHC G/KW HR (G/HP HR)	1.66 (1.24)	.90 (.67)	.49 (.36)	1.27 (.95)
BSCO G/KW HR (G/HP HR)	5.06 (3.77)	2.42 (1.80)	1.08 (.80)	9.52 (7.10)
BSCO2 G/KW HR (G/HP HR)	1244.58 (928.08)	969.03 (722.61)	763.60 (569.41)	972.01 (724.83)
BSNOX G/KW HR (G/HP HR)	11.74 (8.75)	9.77 (7.29)	10.50 (7.83)	12.72 (9.49)
BSFC KG/KW HR (LB/HP HR)	.395 (.650)	.307 (.504)	.241 (.396)	.311 (.512)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	18.80 (25.21)	
BSHC G/KW HR (G/HP HR)	.78 (.58)	
BSCO G/KW HR (G/HP HR)	2.77 (2.07)	
BSCO2 G/KW HR (G/HP HR)	875. (652.)	
BSNOX G/KW HR (G/HP HR)	10.78 (8.04)	(continuous)
BSFC KG/KW HR (LB/HP HR)	.277 (.455)	

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	9.93
	G/KWHR(G/HPHR)	.53 (.39)
	G/KG FUEL (G/LB FUEL)	1.91 (.87)
	FILTER EFF.	96.1

TABLE B-7. ENGINE EMISSION RESULTS CONTINUOUS NO_x (cont'd)
H-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D60
ENGINE MODEL 0 D.D. 8V92TA
ENGINE 0.0 L(0. CID)
CVS NO. 10

TEST NO.D60-2 RUN1
DATE 3/20/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 744.22 MM HG(29.30 IN HG)
DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)

RELATIVE HUMIDITY , ENGINE-55. PCT , CVS-29. PCT
ABSOLUTE HUMIDITY 9.1 GM/KG(63.7 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER				
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	635.0 (25.0)	635.0 (25.0)	635.0 (25.0)	635.0 (25.0)
BLOWER INLET P MM. H2O(IN. H2O)	502.9 (19.8)	502.9 (19.8)	502.9 (19.8)	502.9 (19.8)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)
BLOWER REVOLUTIONS	6182.	6264.	6371.	6221.
TIME SECONDS	296.1	300.0	305.0	297.0
TOTAL FLOW STD. CU. METRES(SCF)	279.4 (9869.)	283.1 (10000.)	288.0 (10171.)	281.2 (9933.)
HC SAMPLE METER/RANGE/PPM	19.6/22/ 20.	24.2/22/ 24.	39.2/22/ 39.	25.2/22/ 25.
HC BCKGRD METER/RANGE/PPM	6.3/ 2/ 6.	7.0/ 2/ 7.	6.8/ 2/ 7.	5.9/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	80.2/13/ 79.	39.2/13/ 36.	43.2/13/ 40.	72.7/13/ 71.
CO BCKGRD METER/RANGE/PPM	2.0/13/ 2.	2.0/13/ 2.	2.1/13/ 2.	1.9/13/ 2.
CO2 SAMPLE METER/RANGE/PCT	59.7/11/ .49	75.9/11/ .69	90.5/ 3/ 1.69	60.1/11/ .50
CO2 BCKGRD METER/RANGE/PCT	8.2/11/ .05	8.8/11/ .05	3.3/ 3/ .05	9.1/11/ .06
NOX SAMPLE METER/RANGE/PPM	5.4/14/ 54.	7.6/14/ 76.	22.5/14/ 225.	5.9/14/ 59.
NOX BCKGRD METER/RANGE/PPM	.5/ 2/ 1.	.8/ 2/ 1.	.5/ 3/ 2.	1.2/ 2/ 1.
DILUTION FACTOR	26.70	19.33	7.90	26.48
HC CONCENTRATION PPM	14.	18.	33.	20.
CO CONCENTRATION PPM	76.	34.	37.	68.
CO2 CONCENTRATION PCT	.44	.64	1.64	.44
NOX CONCENTRATION PPM	52.7	74.4	218.3	57.2
HC MASS GRAMS	2.18	2.87	5.53	3.17
CO MASS GRAMS	24.79	11.18	12.42	22.30
CO2 MASS GRAMS	2274.7	3301.4	8672.6	2283.9
NOX MASS GRAMS	28.19	40.27	120.23	30.76
FUEL KG (LB)	.729 (1.61)	1.046 (2.30)	2.736 (6.03)	.732 (1.61)
KW HR (HP HR)	2.35 (3.15)	3.67 (4.92)	11.30 (15.15)	2.42 (3.24)
BSHC G/KW HR (G/HP HR)	.93 (.69)	.78 (.58)	.49 (.37)	1.31 (.98)
BSCO G/KW HR (G/HP HR)	10.55 (7.87)	3.05 (2.27)	1.10 (.82)	9.23 (6.88)
BSCO2 G/KW HR (G/HP HR)	968.39 (722.13)	899.84 (671.01)	767.67 (572.45)	945.30 (704.91)
BSNOX G/KW HR (G/HP HR)	12.00 (8.95)	10.98 (8.19)	10.64 (7.94)	12.73 (9.49)
BSFC KG/KW HR (LB/HP HR)	.310 (.510)	.285 (.468)	.242 (.398)	.303 (.498)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	19.73 (26.46)
BSHC G/KW HR (G/HP HR)	.70 (.52)
BSCO G/KW HR (G/HP HR)	3.58 (2.67)
BSCO2 G/KW HR (G/HP HR)	838. (625.)
BSNOX G/KW HR (G/HP HR)	11.12 (8.29) (continuous)
BSFC KG/KW HR (LB/HP HR)	.266 (.437)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES GRAMS/TEST	10.33
G/KWHR(G/HPHR)	.52 (.39)
G/KG FUEL (G/LB FUEL)	1.97 (.89)
FILTER EFF.	96.7

TABLE B-8. ENGINE EMISSION RESULTS
C-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D60
ENGINE MODEL 0 D.D. 8V92TA
ENGINE 0.0 L(0. CID)
CVS NO. 10

TEST NO.D60-3 RUN1
DATE 3/21/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 741.93 MM HG(29.21 IN HG)
DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)

RELATIVE HUMIDITY , ENGINE-57. PCT , CVS-34. PCT
ABSOLUTE HUMIDITY 9.1 GM/KG(64.0 GRAINS/LB) NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1	2	3	4
BAG NUMBER	NYNF	LANF	LAF	NYNF
DESCRIPTION				
BLOWER DIF P MM. H2O(IN. H2O)	632.5 (24.9)	632.5 (24.9)	632.5 (24.9)	632.5 (24.9)
BLOWER INLET P MM. H2O(IN. H2O)	497.8 (19.6)	497.8 (19.6)	497.8 (19.6)	497.8 (19.6)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)
BLOWER REVOLUTIONS	6184.	6265.	6374.	6221.
TIME SECONDS	296.1	300.1	305.1	298.0
TOTAL FLOW STD. CU. METRES(SCF)	278.8 (9846.)	282.4 (9975.)	287.3 (10148.)	280.4 (9904.)
HC SAMPLE METER/RANGE/PPM	24.7/22/ 25.	24.0/22/ 24.	39.5/22/ 39.	25.9/22/ 26.
HC BCKGRD METER/RANGE/PPM	5.2/ 2/ 5.	5.1/ 2/ 5.	6.3/ 2/ 6.	6.2/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	32.9/13/ 30.	26.3/13/ 24.	43.0/13/ 40.	75.5/13/ 74.
CO BCKGRD METER/RANGE/PPM	1.9/13/ 2.	1.5/13/ 1.	2.0/13/ 2.	1.5/13/ 1.
CO2 SAMPLE METER/RANGE/PCT	60.0/11/ .50	74.9/11/ .67	90.2/ 3/ 1.68	60.9/11/ .51
CO2 BCKGRD METER/RANGE/PCT	10.6/11/ .06	9.0/11/ .05	4.0/ 3/ .06	8.7/11/ .05
NOX SAMPLE METER/RANGE/PPM	36.8/ 2/ 37.	55.3/ 2/ 55.	61.8/ 3/ 185.	50.5/ 2/ 51.
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ 0.	.3/ 2/ 0.	.6/ 3/ 2.	.3/ 2/ 0.
DILUTION FACTOR	26.75	19.74	7.93	26.00
HC CONCENTRATION PPM	20.	19.	34.	20.
CO CONCENTRATION PPM	28.	22.	37.	71.
CO2 CONCENTRATION PCT	.43	.62	1.63	.45
NOX CONCENTRATION PPM	36.5	55.0	183.8	50.2
HC MASS GRAMS	3.17	3.13	5.63	3.23
CO MASS GRAMS	9.12	7.31	12.34	23.30
CO2 MASS GRAMS	2210.3	3219.1	8570.6	2336.1
NOX MASS GRAMS	19.47	29.72	101.04	26.93
FUEL KG (LB)	.702 (1.55)	1.018 (2.24)	2.704 (5.96)	.749 (1.65)
KW HR (HP HR)	1.90 (2.55)	3.27 (4.38)	11.27 (15.11)	2.36 (3.17)
BSHC G/KW HR (G/HP HR)	1.67 (1.24)	.96 (.71)	.50 (.37)	1.37 (1.02)
BSCO G/KW HR (G/HP HR)	4.80 (3.58)	2.24 (1.67)	1.09 (.82)	9.86 (7.35)
BSCO2 G/KW HR (G/HP HR)	1162.38 (866.78)	985.58 (734.95)	760.65 (567.21)	988.26 (736.94)
BSNOX G/KW HR (G/HP HR)	10.24 (7.64)	9.10 (6.79)	8.97 (6.69)	11.39 (8.50)
BSFC KG/KW HR (LB/HP HR)	.369 (.607)	.312 (.512)	.240 (.395)	.317 (.521)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	18.80 (25.21)
BSHC G/KW HR (G/HP HR)	.81 (.60)
BSCO G/KW HR (G/HP HR)	2.77 (2.07)
BSCO2 G/KW HR (G/HP HR)	869. (648.)
BSNOX G/KW HR (G/HP HR)	9.42 (7.03)
BSFC KG/KW HR (LB/HP HR)	.275 (.452)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	9.98
	G/KWHR(G/HPHR)	.53 (.40)
	G/KG FUEL (G/LB FUEL)	1.93 (.87)
	FILTER EFF.	95.6

TABLE B-8. ENGINE EMISSION RESULTS (cont'd)
H-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D60
ENGINE MODEL 0 D.D. 8V92TA
ENGINE 0.0 L(0. CID)
CVS NO. 10

TEST NO.D60-3 RUN1
DATE 3/21/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 741.68 MM HG(29.20 IN HG)
DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)

RELATIVE HUMIDITY , ENGINE-56. PCT , CVS-38. PCT
ABSOLUTE HUMIDITY 9.2 GM/KG(64.5 GRAINS/LB) NOX HUMIDITY C.F. 1.0000

BAG RESULTS

	1	2	3	4
BAG NUMBER				
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	640.1 (25.2)	640.1 (25.2)	640.1 (25.2)	640.1 (25.2)
BLOWER INLET P MM. H2O(IN. H2O)	505.5 (19.9)	505.5 (19.9)	505.5 (19.9)	505.5 (19.9)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)
BLOWER REVOLUTIONS	6182.	6265.	6372.	6222.
TIME SECONDS	296.1	300.1	305.0	299.5
TOTAL FLOW STD. CU. METRES(SCF)	278.2 (9825.)	281.9 (9957.)	286.7 (10128.)	279.9 (9886.)
HC SAMPLE METER/RANGE/PPM	21.2/22/ 21.	24.4/22/ 24.	39.1/22/ 39.	26.4/22/ 26.
HC BCKGRD METER/RANGE/PPM	6.3/ 2/ 6.	6.5/ 2/ 7.	6.6/ 2/ 7.	5.4/ 2/ 5.
CO SAMPLE METER/RANGE/PPM	84.1/13/ 84.	41.9/13/ 39.	43.4/13/ 41.	76.3/13/ 75.
CO BCKGRD METER/RANGE/PPM	1.9/13/ 2.	2.2/13/ 2.	1.8/13/ 2.	1.3/13/ 1.
CO2 SAMPLE METER/RANGE/PCT	59.4/11/ .49	76.6/11/ .70	86.8/ 3/ 1.61	58.9/11/ .48
CO2 BCKGRD METER/RANGE/PCT	8.4/11/ .05	8.8/11/ .05	3.3/ 3/ .05	7.6/11/ .05
NOX SAMPLE METER/RANGE/PPM	48.0/ 2/ 48.	68.7/ 2/ 69.	59.6/ 3/ 179.	50.0/ 2/ 50.
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ 0.	.7/ 2/ 1.	.4/ 3/ 1.	.5/ 2/ 1.
DILUTION FACTOR	26.85	19.07	8.28	27.16
HC CONCENTRATION PPM	15.	18.	33.	21.
CO CONCENTRATION PPM	80.	36.	37.	72.
CO2 CONCENTRATION PCT	.44	.65	1.57	.44
NOX CONCENTRATION PPM	47.7	68.0	177.7	49.5
HC MASS GRAMS	2.42	2.97	5.51	3.42
CO MASS GRAMS	26.03	11.89	12.49	23.57
CO2 MASS GRAMS	2241.6	3335.2	8227.8	2252.2
NOX MASS GRAMS	25.39	36.69	97.50	26.51
FUEL KG (LB)	.719 (1.59)	1.057 (2.33)	2.596 (5.72)	.723 (1.59)
KW HR (HP HR)	2.36 (3.16)	3.69 (4.95)	11.30 (15.16)	2.36 (3.17)
BSHC G/KW HR (G/HP HR)	1.03 (.77)	.80 (.60)	.49 (.36)	1.45 (1.08)
BSCO G/KW HR (G/HP HR)	11.04 (8.24)	3.22 (2.40)	1.10 (.82)	9.97 (7.44)
BSCO2 G/KW HR (G/HP HR)	951.27 (709.36)	903.55 (673.78)	727.81 (542.73)	952.75 (710.46)
BSNOX G/KW HR (G/HP HR)	10.77 (8.03)	9.94 (7.41)	8.62 (6.43)	11.22 (8.36)
BSFC KG/KW HR (LB/HP HR)	.305 (.502)	.286 (.471)	.230 (.378)	.306 (.503)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	19.72 (26.44)
BSHC G/KW HR (G/HP HR)	.73 (.54)
BSCO G/KW HR (G/HP HR)	3.75 (2.80)
BSCO2 G/KW HR (G/HP HR)	814. (607.)
BSNOX G/KW HR (G/HP HR)	9.44 (7.04)
BSFC KG/KW HR (LB/HP HR)	.258 (.425)

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	13.71
	G/KWHR(G/HPHR)	.70 (.52)
	G/KG FUEL (G/LB FUEL)	2.69 (1.22)
	FILTER EFF.	97.0

TABLE B-9. ENGINE EMISSION RESULTS CONTINUOUS NO_x
C-TRANS.

PROJECT NO. 03-7338-016

ENGINE NO.D60
ENGINE MODEL 0 D.D. 8V92TA
ENGINE 0.0 L(0. CID)
CVS NO. 10

TEST NO.D60-3 RUN1
DATE 3/21/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 741.93 MM HG(29.21 IN HG)
DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)

RELATIVE HUMIDITY , ENGINE-57. PCT , CVS-34. PCT
ABSOLUTE HUMIDITY 9.1 GM/KG(64.0 GRAINS/LB)

NOX HUMIDITY C.F. 1.0000

BAG RESULTS	1 NYNF	2 LANF	3 LAF	4 NYNF
BAG NUMBER				
DESCRIPTION				
BLOWER DIF P MM. H2O(IN. H2O)	632.5 (24.9)	632.5 (24.9)	632.5 (24.9)	632.5 (24.9)
BLOWER INLET P MM. H2O(IN. H2O)	497.8 (19.6)	497.8 (19.6)	497.8 (19.6)	497.8 (19.6)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)
BLOWER REVOLUTIONS	6184.	6265.	6374.	6221.
TIME SECONDS	296.1	300.1	305.1	298.0
TOTAL FLOW STD. CU. METRES(SCF)	278.8 (9846.)	282.4 (9975.)	287.3 (10148.)	280.4 (9904.)
HC SAMPLE METER/RANGE/PPM	24.7/22/ 25.	24.0/22/ 24.	39.5/22/ 39.	25.9/22/ 26.
HC BCKGRD METER/RANGE/PPM	5.2/ 2/ 5.	5.1/ 2/ 5.	6.3/ 2/ 6.	6.2/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	32.9/13/ 30.	26.3/13/ 24.	43.0/13/ 40.	75.5/13/ 74.
CO BCKGRD METER/RANGE/PPM	1.9/13/ 2.	1.5/13/ 1.	2.0/13/ 2.	1.5/13/ 1.
CO2 SAMPLE METER/RANGE/PCT	60.0/11/ .50	74.9/11/ .67	90.2/ 3/ 1.68	60.9/11/ .51
CO2 BCKGRD METER/RANGE/PCT	10.6/11/ .06	9.0/11/ .05	4.0/ 3/ .06	8.7/11/ .05
NOX SAMPLE METER/RANGE/PPM	4.4/14/ 44.	6.2/14/ 62.	21.5/14/ 215.	5.7/14/ 57.
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ 0.	.3/ 2/ 0.	.6/ 3/ 2.	.3/ 2/ 0.
DILUTION FACTOR	26.75	19.74	7.93	26.00
HC CONCENTRATION PPM	20.	19.	34.	20.
CO CONCENTRATION PPM	28.	22.	37.	71.
CO2 CONCENTRATION PCT	.43	.62	1.63	.45
NOX CONCENTRATION PPM	42.8	60.5	207.9	55.4
HC MASS GRAMS	3.17	3.13	5.63	3.23
CO MASS GRAMS	9.12	7.31	12.34	23.30
CO2 MASS GRAMS	2210.3	3219.1	8570.6	2336.1
NOX MASS GRAMS	22.82	32.71	114.29	29.70
FUEL KG (LB)	.702 (1.55)	1.018 (2.24)	2.704 (5.96)	.749 (1.65)
KW HR (HP HR)	1.90 (2.55)	3.27 (4.38)	11.27 (15.11)	2.36 (3.17)
BSHC G/KW HR (G/HP HR)	1.67 (1.24)	.96 (.71)	.50 (.37)	1.37 (1.02)
BSCO G/KW HR (G/HP HR)	4.80 (3.58)	2.24 (1.67)	1.09 (.82)	9.86 (7.35)
BSCO2 G/KW HR (G/HP HR)	1162.38 (866.78)	985.58 (734.95)	760.65 (567.21)	988.26 (736.94)
BSNOX G/KW HR (G/HP HR)	12.00 (8.95)	10.01 (7.47)	10.14 (7.56)	12.56 (9.37)
BSFC KG/KW HR (LB/HP HR)	.369 (.607)	.312 (.512)	.240 (.395)	.317 (.521)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	18.80 (25.21)	
BSHC G/KW HR (G/HP HR)	.81 (.60)	
BSCO G/KW HR (G/HP HR)	2.77 (2.07)	
BSCO2 G/KW HR (G/HP HR)	869. (648.)	
BSNOX G/KW HR (G/HP HR)	10.61 (7.91)	(continuous)
BSFC KG/KW HR (LB/HP HR)	.275 (.452)	

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	9.98
	G/KWHR(G/HPHR)	.53 (.40)
	G/KG FUEL (G/LB FUEL)	1.93 (.87)
	FILTER EFF.	95.6

TABLE B-9. ENGINE EMISSION RESULTS CONTINUOUS NO_x (cont'd)
H-TRANS. PROJECT NO. 03-7338-016

ENGINE NO.D60
ENGINE MODEL 0 D.D. 8V92TA
ENGINE 0.0 L(0. CID)
CVS NO. 10

TEST NO.D60-3 RUN1
DATE 3/21/84
TIME
DYNO NO. 5

DIESEL EM-528-F
BAG CART NO. 1

BAROMETER 741.68 MM HG(29.20 IN HG)
DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)

RELATIVE HUMIDITY , ENGINE-56. PCT , CVS-38. PCT
ABSOLUTE HUMIDITY 9.2 GM/KG(64.5 GRAINS/LB) NOX HUMIDITY C.F. 1.0000

BAG RESULTS

BAG NUMBER	1	2	3	4
DESCRIPTION	NYNF	LANF	LAF	NYNF
BLOWER DIF P MM. H2O(IN. H2O)	640.1 (25.2)	640.1 (25.2)	640.1 (25.2)	640.1 (25.2)
BLOWER INLET P MM. H2O(IN. H2O)	505.5 (19.9)	505.5 (19.9)	505.5 (19.9)	505.5 (19.9)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)	46.1 (115.0)
BLOWER REVOLUTIONS	6187	6265.	6372.	6222.
TIME SECONDS	296.1	300.1	305.0	299.5
TOTAL FLOW STD. CU. METRES(SCF)	278.2 (9825.)	281.9 (9957.)	286.7 (10128.)	279.9 (9886.)
HC SAMPLE METER/RANGE/PPM	21.2/22/ 21.	24.4/22/ 24.	39.1/22/ 39.	26.4/22/ 26.
HC BCKGRD METER/RANGE/PPM	6.3/ 2/ 6.	6.5/ 2/ 7.	6.6/ 2/ 7.	5.4/ 2/ 5.
CO SAMPLE METER/RANGE/PPM	84.1/13/ 84.	41.9/13/ 39.	43.4/13/ 41.	76.3/13/ 75.
CO BCKGRD METER/RANGE/PPM	1.9/13/ 2.	2.2/13/ 2.	1.8/13/ 2.	1.3/13/ 1.
CO2 SAMPLE METER/RANGE/PCT	59.4/11/ .49	76.6/11/ .70	86.8/ 3/ 1.61	58.9/11/ .48
CO2 BCKGRD METER/RANGE/PCT	8.4/11/ .05	8.8/11/ .05	3.3/ 3/ .05	7.6/11/ .05
NOX SAMPLE METER/RANGE/PPM	5.4/14/ 54.	7.6/14/ 76.	22.2/14/ 222.	5.7/14/ 57.
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ 0.	.7/ 2/ 1.	.4/ 3/ 1.	.5/ 2/ 1.
DILUTION FACTOR	26.85	19.07	8.28	27.16
HC CONCENTRATION PPM	15.	18.	33.	21.
CO CONCENTRATION PPM	80.	36.	37.	72.
CO2 CONCENTRATION PCT	.44	.65	1.57	.44
NOX CONCENTRATION PPM	52.8	73.7	214.8	55.3
HC MASS GRAMS	2.42	2.97	5.51	3.42
CO MASS GRAMS	26.03	11.89	12.49	23.57
CO2 MASS GRAMS	2241.6	3335.2	8227.8	2252.2
NOX MASS GRAMS	28.09	39.76	117.83	29.61
FUEL KG (LB)	.719 (1.59)	1.057 (2.33)	2.596 (5.72)	.723 (1.59)
KW HR (HP HR)	2.36 (3.16)	3.69 (4.95)	11.30 (15.16)	2.36 (3.17)
BSHC G/KW HR (G/HP HR)	1.03 (.77)	.80 (.60)	.49 (.36)	1.45 (1.08)
BSCO G/KW HR (G/HP HR)	11.04 (8.24)	3.22 (2.40)	1.10 (.82)	9.97 (7.44)
BSCO2 G/KW HR (G/HP HR)	951.27 (709.36)	903.55 (673.78)	727.81 (542.73)	952.75 (710.46)
BSNOX G/KW HR (G/HP HR)	11.92 (8.89)	10.77 (8.03)	10.42 (7.77)	12.53 (9.34)
BSFC KG/KW HR (LB/HP HR)	.305 (.502)	.286 (.471)	.230 (.378)	.306 (.503)

TOTAL TEST RESULTS 4 BAGS

TOTAL KW HR (HP HR)	19.72 (26.44)	
BSHC G/KW HR (G/HP HR)	.73 (.54)	
BSCO G/KW HR (G/HP HR)	3.75 (2.80)	
BSCO2 G/KW HR (G/HP HR)	814. (607.)	
BSNOX G/KW HR (G/HP HR)	10.92 (8.14)	(continuous)
BSFC KG/KW HR (LB/HP HR)	.258 (.425)	

PARTICULATE RESULTS, TOTAL FOR 4 BAGS

90MM PARTICULATE RATES	GRAMS/TEST	13.71
	G/KWHR(G/HPHR)	.70 (.52)
	G/KG FUEL (G/LB FUEL)	2.69 (1.22)
	FILTER EFF.	97.0

TABLE B-10. TRANSIENT ENGINE MAP DATA

Engine Model DDA 8V92TA

Date: 3/15/84 Operator: E. Krueger Engr.: ~~[illegible]~~ Engine Hours: ——

Barometric Pressure 29.16 in. Hg

Transient Map Results

Speed, rpm	Torque, ft-lb[a]	Speed, rpm	Torque, ft-lb[a]
100	648	2300	——
200	648	2400	——
300	648	2500	——
400	648	2600	——
500	648	2700	——
600	678	2800	——
700	748	2900	——
800	818	3000	——
900	938	3100	——
1000	1074	3200	——
1100	1164	3300	——
1200	1216	3400	——
1300	1247	3500	——
1400	1251	3600	——
1500	1244	3700	——
1600	1229	3800	——
1700	1216	3900	——
1800	1193	4000	——
1900	1161	4100	——
2000	924	4200	——
2100	268	4300	——
2200	0	4400	——

Idle Speed 600 rpm

Max. Power 420 hp (1161 ft-lb) @ 1700 rpm

Max. Torque 1251 ft-lb @ 1400 rpm

Transient Cycle Work by Command, hp-hr

Segment 1	Segment 2	Segment 3	Segment 4	Total
3.17	5.37	15.55	3.16	27.25